Report

European antimicrobial resistance surveillance for Belgium (EARS-BE) 2019 – description of main findings.

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Introduction

This report describes main findings of the "EARS-BE 2019" study, which covers annual data collection for Belgium and 2019 of the European antimicrobial resistance surveillance network (EARS-NET)[1]. Coordinated by the European center for disease prevention and control (ECDC, Stockholm), EARS-NET is the main surveillance system for monitoring occurrence and spread of antimicrobial resistance (AMR) in human pathogens across Europe. EARS-BE differs from EARS-NET only in the additional collection of data on Antimicrobial susceptibility tests (ASTs) on isolates from urine (next to blood and cerebrospinal fluid (CSF)). EARS-BE 2019 data on blood/CSF isolates were submitted in August 2020 to ECDC for inclusion in the Annual European report on antimicrobial resistance[1]; the ECDC report's results for Belgium will correspond (save for minor differences due to calculation of indicators) with EUCAST-interpreted results presented here.

The background and methodology of EARS-BE 2019 can be found elsewhere[2]. The results presented and discussed here are derived from the "EARS-BE 2019 statistical report"[3]. This report contains all EARS-BE 2019 reference data, including indicators on laboratory, patient and isolate characteristics, and AST results for studied sample types (blood, CSF, urine) and pathogens (*Staphylococcus aureus*, *Streptococcus pneumoniae*, *Enterococcus faecalis*, *Enterococcus faecium*, *Escherichia coli*, *Proteus mirabilis*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Acinetobacter* spp.). For each AST, the number of laboratories contributing results, the overall testing percentage, and the resistance percentage interpreted according to EUCAST (European committee on antimicrobial susceptibility testing) guidelines, are given as well. Furthermore, the statistical report presents results for isolates obtained from blood/CSF side-by-side with those from urine samples, and this for following sets of inclusion criteria and subgroups:

(1) general EARS-BE 2019 inclusion criteria, as defined in the surveillance protocol;

(2) (1), restricted to hospital laboratories;

(3) (1), restricted to hospital laboratories and EUCAST-interpreted ASTs;

(4) (1), restricted to non-hospital laboratories;

(5) (2), restricted to hospitalized patients.

For blood/CSF isolates, results in this report will be based mostly on results of (1), which are entirely based on hospital laboratories. For urine isolates of Enterococci, *E coli*, *P mirabilis*, *K pneumoniae* and *P aeruginosa*, we will present results of hospital laboratories (2 and 3) separately from those of non-hospital laboratories (4). Due to the majority of laboratories using EUCAST guidelines (see further), the results of analyses (2) and (3) are almost equal.

Participation

National collection of 2019 EARSBE data took considerably more efforts as compared to previous years, and this due to many laboratories as well as Sciensano being overwhelmed by the COVID-19 crisis.

Blood/CSF isolates: Twenty-nine laboratories submitted AST results on isolates from blood/CSF samples taken in 2019 (statistical report Table OV.1). All 29 labs were associated to an acute care hospital. Compared to 2018, the overall number of labs reporting results of blood/CSF samples decreased slightly (with 31 hospitals labs having submitted 2018 data). Of the 32 labs participating in 2018, 24 submitted 2019 data. In terms of regional distribution of hospital laboratories submitting 2019 data, Flanders (18/29 labs = 62%) is overrepresented by about 10% and Wallonia (8/29 labs=28%) is underrepresented by about 10% when compared to the national distribution. In terms of type of hospitals, participating hospital laboratories more or less reflect the national distribution.

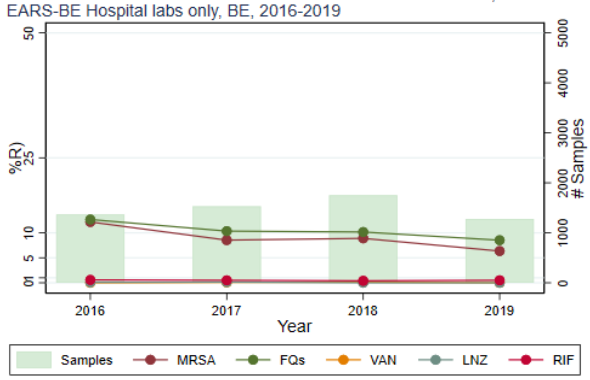
Urine isolates: Thirty laboratories submitted results for urine samples taken in 2019, 6 of these were not associated to an acute care hospital. Distribution of the 24 participating hospital laboratories over the three regions and hospital types was similar as for blood/CSF samples. However, the 6 non-hospital laboratories submitting results on urine samples were all situated in Flanders. Because of this, the results on urine isolates from the non-hospital setting for 2019 presented in this and the statistical report cannot be viewed as representing the national situation.

Use of EUCAST guidelines: For samples taken in 2019, 27 out 29 (92%) hospital labs and all 6 non-hospital labs reported the use of EUCAST guidelines for interpretation of ASTs, this represents a stabilization as compared to 2018. The statistical report still shows a section with results for EUCAST-interpreted ASTs only, but because these results only deviate minimally from those based on all ASTs, these will not be discussed here further.

Results for *Staphylococcus aureus*

Blood/CSF isolates: in 2019, 6.3% (81/1276) of *S aureus* isolates were resistant to methicillin (MRSA), while 8.5% (107/1256) of isolates were resistant to fluoroquinolones. For both antibiotic groups, this represents a further decrease as compared to previous years, with MRSA non-susceptibility and fluoroquinolones resistance in 2016 being 12.3% and 12.7% (Figure STA.EVO.1.1) respectively. Resistance levels to vancomycin, linezolid and rifampicin were very low in 2019. Of note, 29 labs submitted results on 1275 isolates, which is the lowest number since 2015.

Figure STA.EVO.1.1 *Staphylococcus aureus*,
Evolution of antimicrobial resistance within BLOOD/CSF isolates,
EARS-BE Hospital labs only, BE, 2016-2019



MRSA = MRSA , FQs = Fluoroquinolones , VAN = Vancomycin , LNZ = Linezolid , RIF = Rifampicin

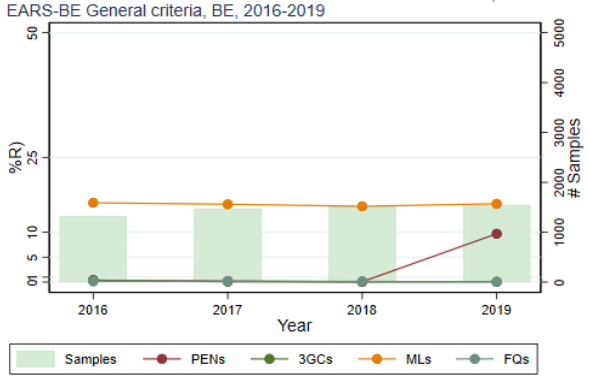
Results for *Streptococcus pneumoniae*

Results obtained from the national surveillance on invasive pneumococcal infections 2019

Results for AMR in *S pneumoniae* isolates are based on 2019 AST data of the national surveillance on invasive pneumococcal infections of the National reference center (UZ Leuven, KU Leuven), and shown in Statistical report Table STRN.1 (see the dedicated annual report[4] for complete results of this surveillance). The data included AST results on blood/CSF isolates submitted by 89 labs, with susceptibility results interpreted according to EUCAST guidelines. The criteria for non-susceptibility (%IR) to penicillins were as follows: (1) for CSF isolates: Minimal inhibitory concentration (MIC)>0.06mg/L; (2) for blood isolates: MIC<=0.06: S; 0.06<MIC=<2 mg/L: I; >2mg/L: R. For blood isolates these interpretation criteria were changed as compared to previous years (up to 2018: blood isolates: MIC>2mg/L: IR). In line with new definitions for resistance introduced by EUCAST in 2019, ECDC reports penicillin resistance in *S pneumoniae* as 'Penicillin non-wild-type resistance'[1], denoting the percentage of isolates interpreted as 'susceptibly, increased exposure (I)' and 'resistant (R)', assuming MICs to benzylpenicillin above those of the wild-type isolates (i.e. >0.06 mg/L).

In 2019, non-wild type resistance to penicillins was 9.7%IR (150/1548), a substantial increase as compared to previous years due to the above documented change in interpretation criteria (Figure STRN.EVO.0.1 below). Resistance levels to 3rd-generation cephalosporins (3GC) and fluoroquinolones were very low, ie 0.1% (1/1548), and 0.1% (1/1548) respectively, while resistance to macrolides was 15.7% (243/1548); four-year trends for these antimicrobials were stable.

Figure STRN.EVO.0.1 *Streptococcus pneumoniae* (NRC),
Evolution of antimicrobial resistance within BLOOD/CSF isolates,
EARS-BE General criteria, BE, 2016-2019



PENs = Penicillins , 3GCs = 3rd-gen Cephalosporins , MLs = Macrolides , FQs = Fluoroquinolones

Results obtained from the EARS-BE 2019 data collection

The results of the EARS-BE 2019 data collection of *S pneumoniae* blood/CSF isolates (29 labs submitting results) are shown in Statistical report Table MAIN.1. For EUCAST-interpreted ASTs, non-wild-type resistance to

penicillins was 9.2% (46/501), macrolide resistance was 16% (86/537), resistance to fluoroquinolones was 1.7% (9/526) and resistance to 3GC was 0%.

Results for Enterococci

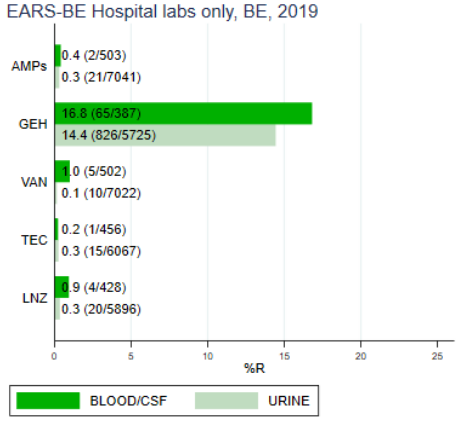
Blood/CSF isolates: *E faecalis* isolates showed low resistance to vancomycin (1%, 5/502) and linezolid (0.9%, 4/428), and very low resistance to aminopenicillins (0.4%, 2/503) and teicoplanin (0.2%, 1/456), see figure ENCFAE.COM.1 below. Resistance to vancomycin reached the 1% level for the first time, although it is difficult to detect trends with such low levels. In *E faecium* isolates, we observed 85.5%R (303/356) to aminopenicillins, 0.8%R (3/358) to vancomycin, 0.3%R (1/303) to teicoplanin, and 0.6%R (2/309) to linezolid, see figure ENCFAI.COM.1. For vancomycin and teicoplanin, these were the lowest resistance levels in 4 years (both antimicrobials exceeding 1%R in period 2016-18).

Urine isolates: in 2019, resistance of *E faecalis* urine isolates to aminopenicillins, nitrofurantoin, vancomycin, teicoplanin, and linezolid were all very low (<1%), and this both for isolates reported by hospital and non-hospital laboratories, see figure ENCFAE.4.3 below. For these antimicrobials & in hospital laboratories, three-year trends were stable (note: data collection in urine isolates was only introduced in the EARSBE 2017 data call). Also for 2019, no difference was observed with resistance in blood/CSF isolates, except possible for vancomycin resistance (0.1% in urine vs 1% in blood/CSF) but this could be due to very low resistance levels in both isolates.

In *E faecium* urine isolates of hospital laboratories, resistance to vancomycin (2.7%, 37/1370) and to teicoplanin (1.7%, 21/1264) was notably higher than blood/CSF samples, see figure ENCFAI.COM.1 below, while resistance to linezolid was similar (0.7%, 9/1266 in urine isolates). Of note, 11 laboratories (out of 23) contributed VRE isolates to the overall 2.7%R vancomycin resistance level. The observed level of resistance to vancomycin in 2019 marked an increase as compared to the previous two years, while resistance to teicoplanin and linezolid remained stable.

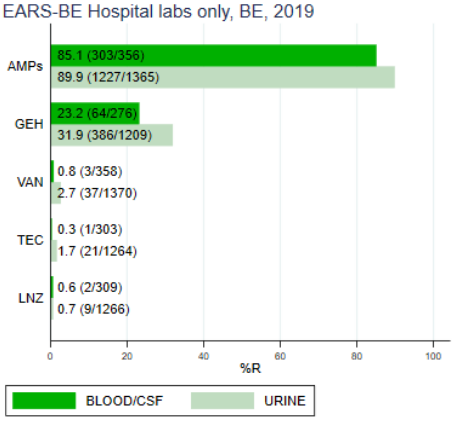
2019 is also the first year since 2017 that vancomycin-resistant and teicoplanin-resistant *E faecium* urine isolates were submitted by non-hospital laboratories, giving resistance levels of 1.4% (3/221) against vancomycin and of 1% (2/209) against teicoplanin, although trends of such levels are difficult to evaluate given the low occurrence of this pathogen in non-hospital settings.

Figure ENCFAE.COM..1 *Enterococcus faecalis*, Antimicrobial resistance in BLOOD/CSF vs URINE isolate EARS-BE Hospital labs only, BE, 2019



AMPs = Aminopenicillins , GEH = Gentamicin high-level , VAN = Vancomycin , TEC = Teicoplanin , LNZ = Linezolid

Figure ENCFAI.COM..1 *Enterococcus faecium*, Antimicrobial resistance in BLOOD/CSF vs URINE isolate EARS-BE Hospital labs only, BE, 2019



AMPs = Aminopenicillins , GEH = Gentamicin high-level , VAN = Vancomycin , TEC = Teicoplanin , LNZ = Linezolid

Figure ENCFAE.4.3 *Enterococcus faecalis*, Antimicrobial resistance within URINE isolates (HOSP vs NON-HOSP labs), EARS-BE, BE, 2019

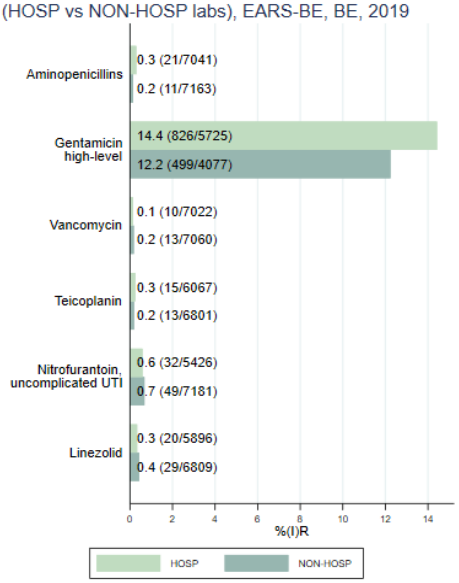
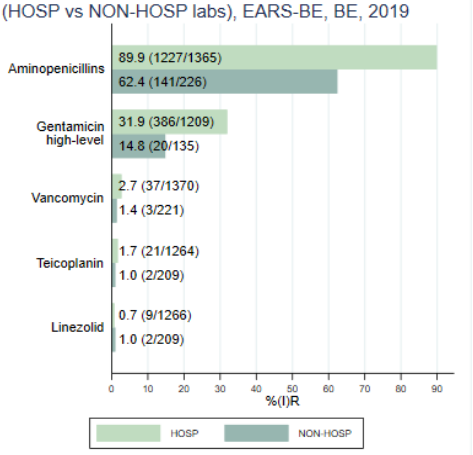


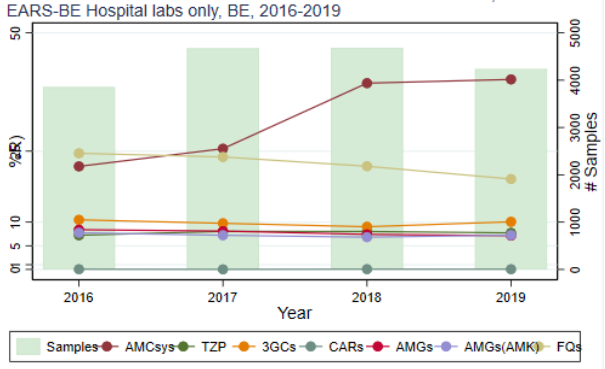
Figure ENCFAI.4.3 *Enterococcus faecium*, Antimicrobial resistance within URINE isolates (HOSP vs NON-HOSP labs), EARS-BE, BE, 2019



Results for *Escherichia coli*

Blood/CSF isolates: For isolates obtained in 2019, we observed 40.2%R (1608/4004) to amoxicillin-clavulanic acid (AMC), 19.1%R (806/4218) to fluoroquinolones, 10.1%R (426/4230) to 3GC, 7.7%R (300/3881) to piperacillin-tazobactam, 7.3%R (306/4219) to aminoglycosides, and almost no resistance to carbapenems. A steadily decreasing 4-year trend was detected for fluoroquinolones resistance (24.5%R in 2016), see also figure ESC.EVO.1.1 below. Note that the shift in resistance to amoxicillin-clavulanic acid in 2018 was documented in last year's report[5], ie due to the introduction of a new card in Vitek systems (BioMérieux) for AMC susceptibility detection in relation to the changes of breakpoints implemented by EUCAST. Resistance to 3rd-generation cephalosporins remained stable in period 2016-2019. Slowly but steadily decreasing 4-year trends were also observed for indicators on combined resistance (based on resistance to aminopenicillins, 3GC, carbapenems, aminoglycosides and/or fluoroquinolones), for example from 3.9%R in 2016 to 3.2%R in 2019 for resistance to four (out of 5) antibiotic groups, see table MAIN.1 in the statistical report.

Figure ESC.EVO.1.1 *Escherichia coli*, Evolution of antimicrobial resistance within BLOOD/CSF isolates, EARS-BE Hospital labs only, BE, 2016-2019



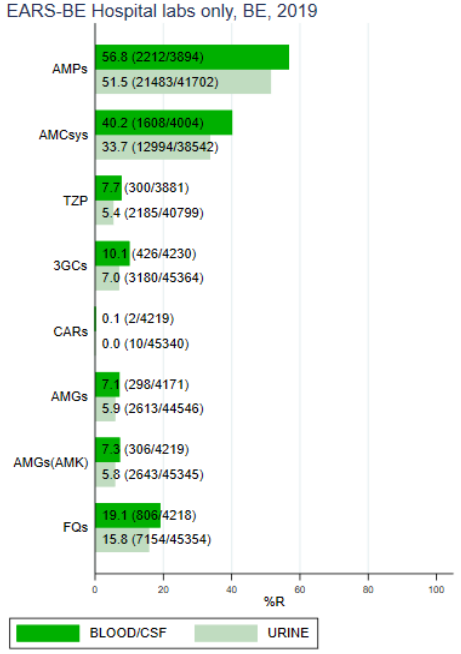
3GCs = 3rd-gen Cephalosporins , CARs = Carbapenems , AMGs = Aminoglycosides , AMGs(AMK) = Aminoglycosides inc Amikacin , FQs = Fluoroquinolones , AMCsys = Amoxicillin-clavulanic acid, systemic infection , TZP = Piperacillin-tazobactam

Urine isolates from hospital laboratories: In 2019, levels of resistance within urine isolates of this group were slightly lower as compared to blood/CSF isolates, see figure ESC.COM.1 below. Also here, a steadily decreasing trend (over 3 years) of resistance to fluoroquinolones was observed (19.1%R in 2017, see figure ESC.EVO.1.2

below). Resistance was 25.6%R to trimethoprim-sulfamethoxazole, 13.5%R to cefuroxime (oral), 2.2%R to temocillin, 1.5%R to nitrofurantoin and 1.5%R to fosfomycin.

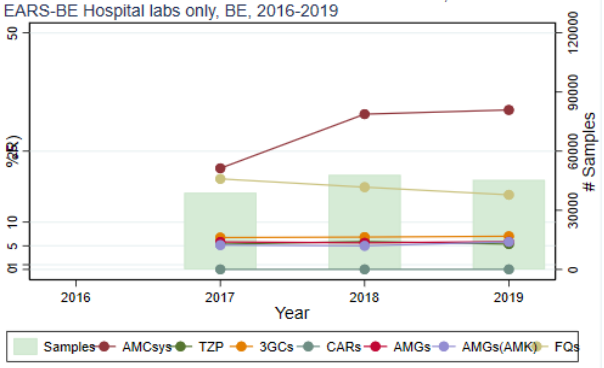
Urine isolates from non-hospital laboratories: Resistance levels in this group were mostly similar or (slightly) lower than those of urine isolates from hospital laboratories, see figures ESC.4.3.1 and ESC.4.3.2 below. Exception to this was the higher observed resistance to amoxicillin-clavulanic acid (uncomplicated urinary tract infection breakpoints, 42.2%R versus 31.9%R in hospital laboratories), although for both hospital and non-hospital laboratories only a minority of urine isolates were submitted with results for this particular AST.

Figure ESC.COM..1 *Escherichia coli*,
Antimicrobial resistance in BLOOD/CSF vs URINE isolate
EARS-BE Hospital labs only, BE, 2019



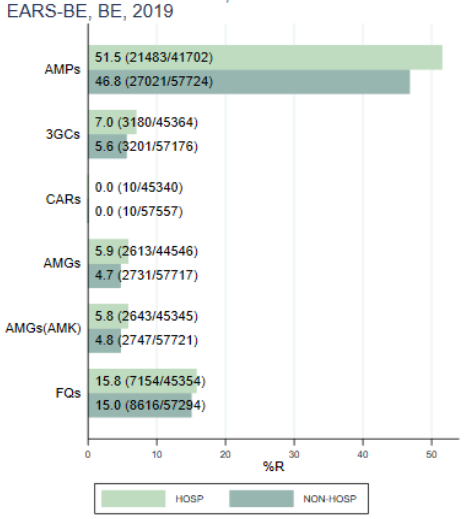
AMPs = Aminopenicillins , AMCsys = Amoxicillin-clavulanic acid, systemic infection , TZP = Piperacillin-tazobactam , 3GCs = 3rd-gen Cephalosporins , CARs = Carbapenems , AMGs = Aminoglycosides , AMGs(AMK) = Aminoglycosides inc Amikacin , FQs = Fluoroquinolones

Figure ESC.EVO.1.2 *Escherichia coli*,
Evolution of antimicrobial resistance within URINE isolates,
EARS-BE Hospital labs only, BE, 2016-2019



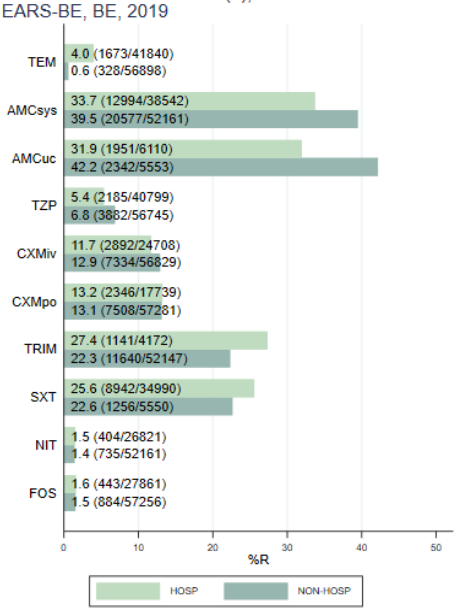
3GCs = 3rd-gen Cephalosporins , CARs = Carbapenems , AMGs = Aminoglycosides , AMGs(AMK) = Aminoglycosides inc Amikacin , FQs = Fluoroquinolones , AMCsys = Amoxicillin-clavulanic acid, systemic infection , TZP = Piperacillin-tazobactam

Figure ESC.4.3.1 *Escherichia coli*,
Antimicrobial resistance within URINE isolates:
HOSP vs NON-HOSP labs,
EARS-BE, BE, 2019



AMPs = Aminopenicillins , 3GCs = 3rd-gen Cephalosporins , CARs = Carbapenems , AMGs = Aminoglycosides , AMGs(AMK) = Aminoglycosides inc Amikacin , FQs = Fluoroquinolones

Figure ESC.4.3.2 *Escherichia coli*,
Antimicrobial resistance within URINE isolates:
HOSP vs NON-HOSP labs (b),
EARS-BE, BE, 2019



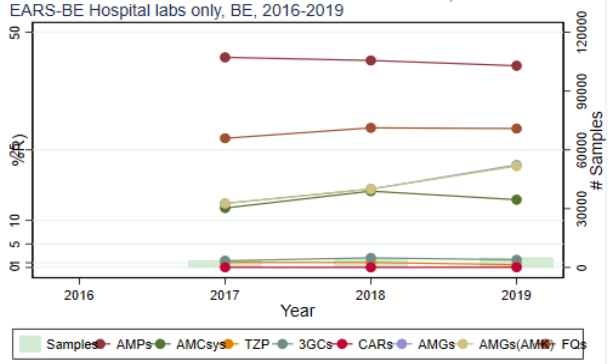
TEM = Temocillin , AMCsys = Amoxicillin-clavulanic acid, systemic infection , AMCuc = Amoxicillin-clavulanic acid, uncomplicated UTI , TZP = Piperacillin-tazobactam , CXMiv = Cefuroxim intravenous , CXMpo = Cefuroxim oral, uncomplicated UTI , TRIM = Trimethoprim, uncomplicated UTI , SXT = Trimethoprim-sulfamethoxazole , NIT = Nitrofurantoin, uncomplicated UTI , FOS = Fosfomycin oral,

Results for *Proteus mirabilis*

Data on this pathogen were collected for the first time by EARS-BE in 2017 to cover the most frequent pathogens isolated from urine samples.

Urine isolates from hospital labs: In 2019, antimicrobial resistance was 42.9%R (2002/4667) to aminopenicillins, 29.5%R (1480/5011) to fluoroquinolones, 21.5%R (1080/5011) to aminoglycosides, 14.4%R (617/4282) to amoxicillin-clavulanic acid, 1.6%R (81/5012) to 3GC, 0.6%R (26/4493) to piperacillin-tazobactam and almost no resistance to carbapenems. Over the 3 observed years of follow-up, an increase was observed in resistance to aminoglycosides (13.6% in 2017), see also figure PRT.EVO.1.2 below. For typical antimicrobials for treatment of UTI, resistance was 30.7%R to trimethoprim-sulfamethoxazole, 22.5% to fosfomycin, 2.5%R to cefuroxime (oral), and 0.8% to temocillin.

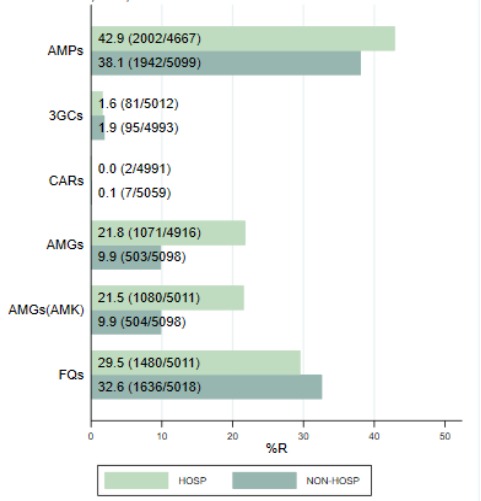
Figure PRT.EVO.1.2 *Proteus mirabilis*,
Evolution of antimicrobial resistance within URINE isolates,
EARS-BE Hospital labs only, BE, 2016-2019



AMPs = Aminopenicillins , 3GCs = 3rd-gen Cephalosporins , CARs = Carbapenems , AMGs = Aminoglycosides , AMGs(AMK) = Aminoglycosides inc Amikacin , FQs = Fluoroquinolones , AMCsys = Amoxicillin-clavulanic acid, systemic infection , TZP = Piperacillin-tazobactam

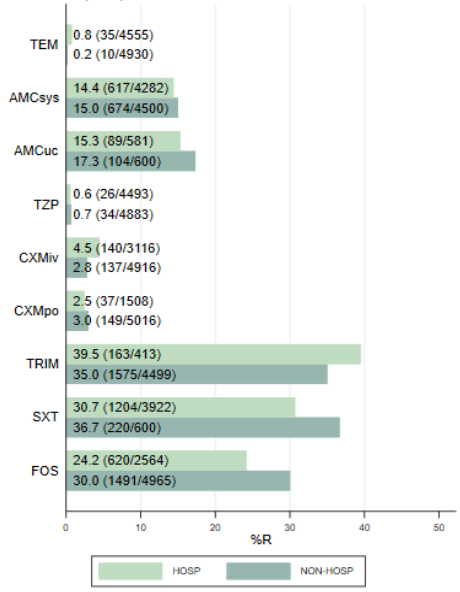
Urine isolates from non-hospital labs: Overall, resistance levels were similar (within 10% relative difference) between isolates from hospital and non-hospital laboratories, see figures PRT.4.3.1 and PRT.4.3.2 below. Exception to this were the lower resistance observed against aminoglycosides (9.4%R vs 21.5%R) and the higher resistance against sulfamethoxazole (36.7%R vs 30.7%R) and fosfomycin (30.6%R vs 22.5%R) in isolates of non-hospital laboratories.

Figure PRT.4.3.1 *Proteus mirabilis*,
Antimicrobial resistance within URINE isolates:
HOSP vs NON-HOSP labs,
EARS-BE, BE, 2019



AMPs = Aminopenicillins , 3GCs = 3rd-gen Cephalosporins , CARs = Carbapenems , AMGs = Aminoglycosides , AMGs(AMK) = Aminoglycosides inc Amikacin , FQs = Fluoroquinolones

Figure PRT.4.3.2 *Proteus mirabilis*,
Antimicrobial resistance within URINE isolates:
HOSP vs NON-HOSP labs (b),
EARS-BE, BE, 2019



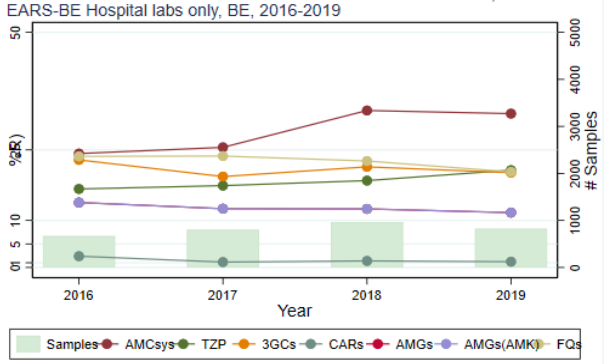
TEM = Temocillin , AMCsys = Amoxicillin-clavulanic acid, systemic infection , AMCuc = Amoxicillin-clavulanic acid, uncomplicated UTI , TZP = Piperacillin-tazobactam , CXMiv = Cefuroxim intravenous , CXMpo = Cefuroxim oral, uncomplicated UTI , TRIM = Trimethoprim, uncomplicated UTI , SXT = Trimethoprim-sulfamethoxazole , FOS = Fosfomycin oral, uncomplicated UTI

Results for *Klebsiella pneumoniae*

Blood/CSF isolates: In 2019, we observed 32.7% (261/798) resistance to amoxicillin-clavulanic acid, 20.7%R (157/759) to piperacillin-tazobactam, 20.3%R (167/822) to fluoroquinolones, 20.1%R (166/824) to 3GC, 11.7%R (96/822) to aminoglycosides and 1.2%R (10/822) to carbapenems. An increasing 4-year trend was observed for

resistance to piperacillin-tazobactam (16.7%R in 2016, 1st time above 20%R in 2019), slightly decreasing trends for aminoglycosides (13.8%R in 2016) and fluoroquinolones (23.6%R in 2016), and a stable trend for resistance against 3rd-generation cephalosporins, see also figure KLE.EVO.1.1 below. Also, since the level of resistance to carbapenems first exceeded 1% in 2016, this level was steadily maintained up to 2019, see table MAIN.1 in the statistical report. Finally, combined resistance to at least one antimicrobial from the group (3GC, carbapenems, aminoglycosides, fluoroquinolones) decreased in 2019 to 25.3%, being the lowest level in 4 years (30.8%R in 2016), however such decrease was not seen in the other indicators for combined resistance.

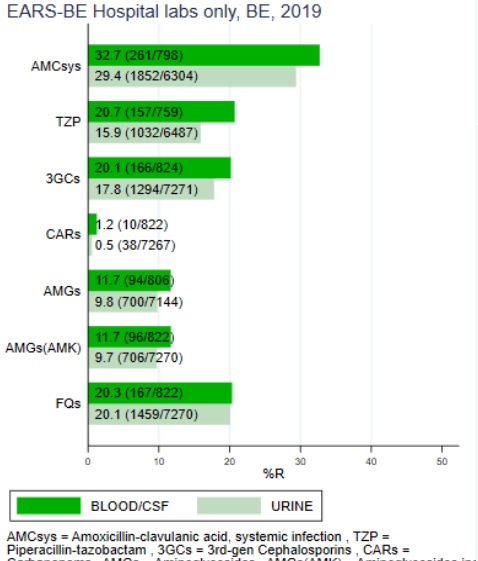
Figure KLE.EVO.1.1 *Klebsiella pneumoniae*,
Evolution of antimicrobial resistance within BLOOD/CSF isolates,
EARS-BE Hospital labs only, BE, 2016-2019



3GCs = 3rd-gen Cephalosporins , CARs = Carbapenems , AMGs = Aminoglycosides , AMGs(AMK) = Aminoglycosides inc Amikacin , FQs = Fluoroquinolones , AMCsys = Amoxicillin-clavulanic acid, systemic infection , TZP = Piperacillin-tazobactam

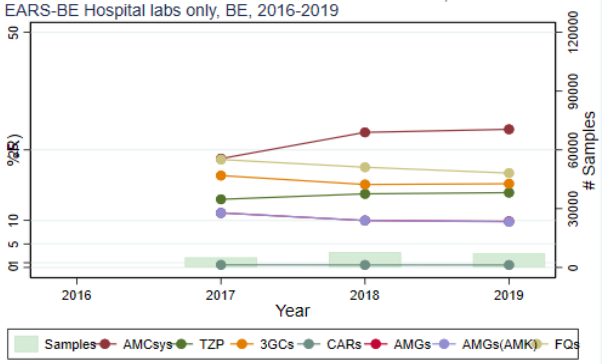
Urine isolates from hospital laboratories: Levels of resistance for these isolates were slightly lower than those observed in blood/CSF isolates, see also figure KLE.COM.1 below. Over 3 years of surveillance, some steadily decreasing trends were observed (see figure KLE.EVO.1.2 below, as well as the indicators for combined resistance in the statistical report[3]). However, these were not always clinically meaningful, it should also be noted that representativeness was not optimal in the 1st year of data collection of urine isolates (2017). As for antimicrobials for treatment of UTI, temocillin resistance was 3.6%, cefuroxime (oral) 20.3%R, trimethoprim-sulfamethoxazole 19.8%R, and fosfomycin 24.9%R.

Figure KLE.COM..1 *Klebsiella pneumoniae*,
Antimicrobial resistance in BLOOD/CSF vs URINE isolate
EARS-BE Hospital labs only, BE, 2019



AMCsys = Amoxicillin-clavulanic acid, systemic infection , TZP = Piperacillin-tazobactam , 3GCs = 3rd-gen Cephalosporins , CARs = Carbapenems , AMGs = Aminoglycosides , AMGs(AMK) = Aminoglycosides inc Amikacin , FQs = Fluoroquinolones

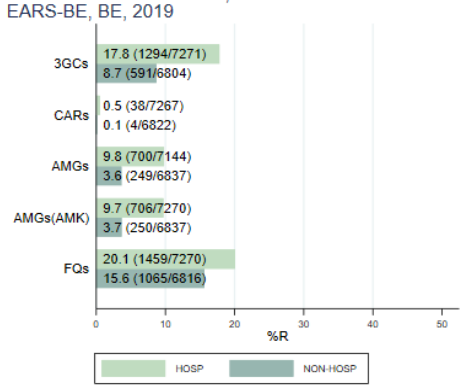
Figure KLE.EVO.1.2 *Klebsiella pneumoniae*,
Evolution of antimicrobial resistance within URINE isolates,
EARS-BE Hospital labs only, BE, 2016-2019



3GCs = 3rd-gen Cephalosporins , CARs = Carbapenems , AMGs = Aminoglycosides , AMGs(AMK) = Aminoglycosides inc Amikacin , FQs = Fluoroquinolones , AMCsys = Amoxicillin-clavulanic acid, systemic infection , TZP = Piperacillin-tazobactam

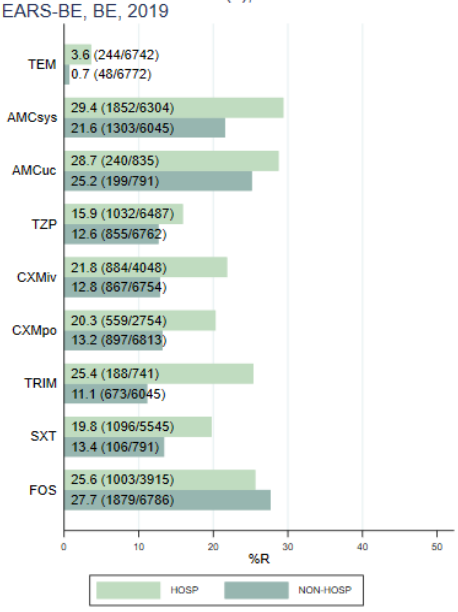
Urine isolates from non-hospital laboratories: Substantially lower levels of resistance were observed in this group, ie about 50-30% less of levels of resistance observed as compared to urine isolates from hospital laboratories, see figures KLE.4.3.1 and KLE.4.3.2 below. Only exception to this was resistance to fosfomycin, for which similar resistance was observed between the two types of laboratories.

Figure KLE.4.3.1 *Klebsiella pneumoniae*, Antimicrobial resistance within URINE isolates: HOSP vs NON-HOSP labs, EARS-BE, BE, 2019



3GCs = 3rd-gen Cephalosporins , CARs = Carbapenems , AMGs = Aminoglycosides , AMGs(AMK) = Aminoglycosides inc Amikacin , FQs = Fluoroquinolones

Figure KLE.4.3.2 *Klebsiella pneumoniae*, Antimicrobial resistance within URINE isolates: HOSP vs NON-HOSP labs (b), EARS-BE, BE, 2019

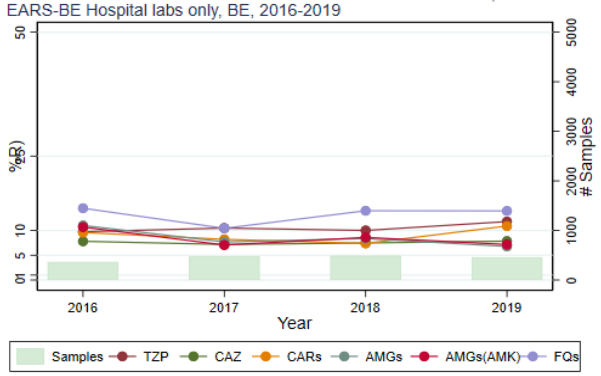


TEM = Temocillin , AMCsys = Amoxicillin-clavulanic acid, systemic infection , AMCuc = Amoxicillin-clavulanic acid, uncomplicated UTI , TZP = Piperacillin-tazobactam , CXMiv = Cefuroxim intravenous , CXMpo = Cefuroxim oral, uncomplicated UTI , TRIM = Trimethoprim, uncomplicated UTI , SXT = Trimethoprim-sulfamethoxazole , FOS = Fosfomycin oral, uncomplicated UTI

Results for *Pseudomonas aeruginosa*

Blood/CSF isolates: we observed 11.8%R (54/458) to piperacillin-tazobactam, 7.8%R (35/446) to ceftazidime, 10.9%R (50/459) to carbapenems, 7.2%R (33/460) to aminoglycosides, and 13.9%R (64/459) to fluoroquinolones. As mentioned in the reports of previous years, due to high year-to-year volatility in resistance rates it remains difficult to detect meaningful trends for this isolate, see also figure PSE.EVO.1.1 below. Resistance to at least one of these antimicrobials was 26.2%R in 2019, which is the highest level in 4 years (22.7%R in 2016).

Figure PSE.EVO.1.1 *Pseudomonas aeruginosa*, Evolution of antimicrobial resistance within BLOOD/CSF isolates, EARS-BE Hospital labs only, BE, 2016-2019



CARs = Carbapenems , AMGs = Aminoglycosides , AMGs(AMK) = Aminoglycosides inc Amikacin , FQs = Fluoroquinolones , TZP = Piperacillin-tazobactam , CAZ = Ceftazidime

Urine isolates from hospital laboratories: When comparing antimicrobial resistance levels between urine and blood/CSF isolates in this group, lower levels of resistance were observed in urine isolates for piperacillin-

tazobactam (7.2%R), ceftazidime (5%R) and carbapenems (5.9%R), similar levels were observed for aminoglycosides (7.7%R) and (slightly) higher levels for fluoroquinolones (15.7%R), see figure PSE.COM.1.

Urine isolates from non-hospital laboratories: Levels of antimicrobial resistance in urine isolates were generally lower in this group, see figure PSE.4.3 below.

Figure PSE.COM..1 *Pseudomonas aeruginosa*, Antimicrobial resistance in BLOOD/CSF vs URINE isolate EARS-BE Hospital labs only, BE, 2019

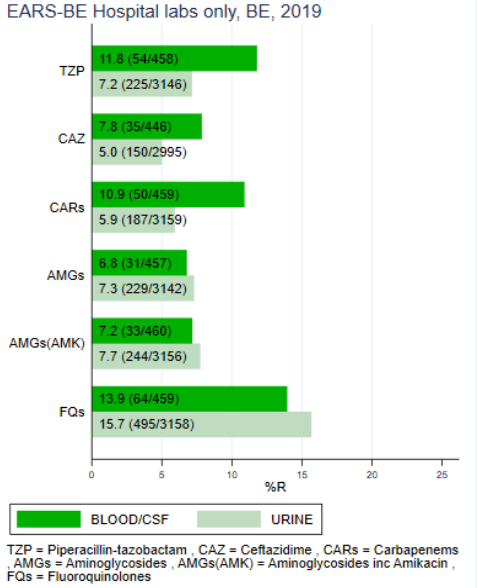
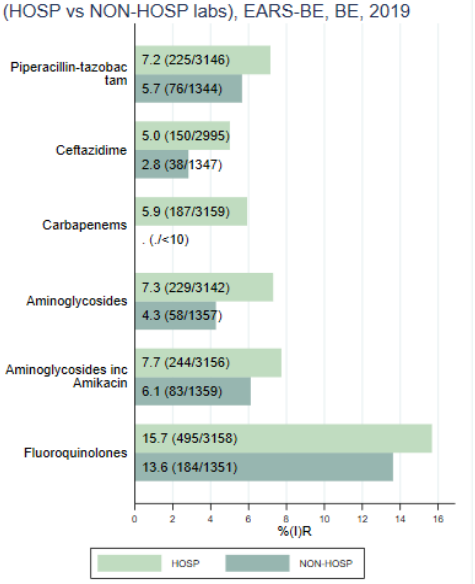


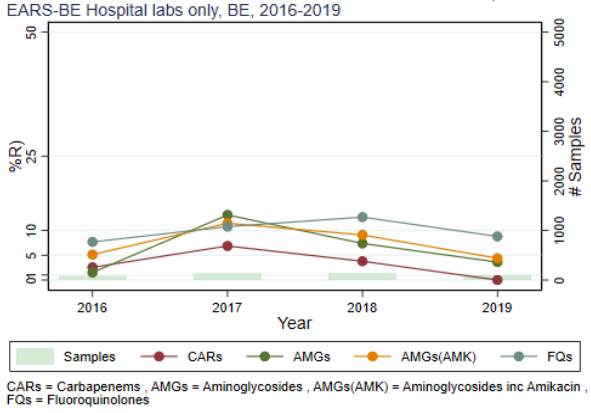
Figure PSE.4.3 *Pseudomonas aeruginosa*, Antimicrobial resistance within URINE isolates (HOSP vs NON-HOSP labs), EARS-BE, BE, 2019



Results for *Acinetobacter* species

Blood/CSF isolates: For 2019, results were obtained from 22 labs on 92 isolates. Such low number of isolates makes it difficult to obtain precise estimates of resistance prevalence on a national level. We observed no resistance to carbapenems, 3.6%R (3/83) to aminoglycosides, and 8.8%R (8/91) to fluoroquinolones. These levels were the lowest observed in the last three years, see figure ACI.EVO.1.1 below. For *A baumannii*, we observed no resistance to carbapenems, 3.1%R (1/32) to aminoglycosides, and 6.3%R (2/32) to fluoroquinolones. All these were lower than the previous year (2018 being the 1st year of follow-up for this pathogen), although this comparison is probably flawed given the very small sample.

Figure ACI.EVO.1.1 *Acinetobacter* spp, Evolution of antimicrobial resistance within BLOOD/CSF isolates, EARS-BE Hospital labs only, BE, 2016-2019



Colistin resistance in *E coli, K pneumoniae, P aeruginosa*

Estimation of national colistin resistance from data on routinely performed ASTs (as collected by EARS-BE) is difficult. This is due to only a subset of laboratories submitting test results as well as to selective testing for this antibiotic (according to sample type, pathogen and other factors such as multidrug resistance vs susceptible AST phenotype). Restricting the analysis to hospital laboratories, colistin test rates on blood/CSF isolates varied from 66.5% in *E coli* (of 20 labs reporting), 72.2% in *K pneumoniae* (of 18 labs reporting), to 84.4% in *P aeruginosa* (of 19 labs reporting). In urine isolates, these rates were 66.9% in *E coli* (17 labs reporting), 66.3% in *K pneumoniae* (16 labs reporting), and 66.9% in *P aeruginosa* (17 labs reporting). In *E coli*, resistance to colistin in 2019 was very low in both blood/CSF isolates and urine isolates (both 0.8%R). In *K pneumoniae* isolates, resistance was 1.5% in blood/CSF isolates and 1% in urine isolates. In *P aeruginosa*, resistance was 0.7% in blood/CSF and 1.3% in urine isolates.

Conclusions

As compared to previous years, the COVID-19 crisis made it much more difficult for laboratories and Sciensano to submit, process, analyze and report results in due time. Twenty-nine labs (all associated to an acute care hospital) submitted results on isolates from blood and cerebrospinal fluid (CSF) samples, while 30 labs (of which 6 not associated to a hospital) submitted results on urine isolates.

In *Staphylococcus aureus* isolates from blood/CSF samples, resistance to methicillin (MRSA) and to fluoroquinolones continued to decrease in 2019. In *Enterococcus faecalis* blood/CSF isolates, resistance to vancomycin reached a level of 1% in 2019. In *Enterococcus faecium* blood/CSF isolates, resistance levels to vancomycin and teicoplanin were the lowest in 4-years (below 1%), but in urine isolates from hospital laboratories these had resistance levels above 1%.

For *Escherichia coli* blood/CSF isolates, steadily decreasing 4-year trends (2016-19) were observed for aminoglycosides, fluoroquinolones and for combined antimicrobial resistance indicators (resistance to aminopenicillins, 3rd generation cephalosporins, carbapenems, aminoglycosides and/or fluoroquinolones). In *Klebsiella pneumoniae* blood/CSF isolates, decreasing 4-year trends were also seen for aminoglycosides and fluoroquinolones, but increasing trends for piperacillin-tazobactam. For both *E coli* and *K pneumoniae* blood/CSF isolates, 4-year trends of resistance to 3rd-generation cephalosporins remained stable. Resistance to carbapenems was (almost) not observed in *E. coli* and very low (around 1%) in *K pneumoniae*.

Pseudomonas aeruginosa showed resistance to almost all studied antibiotic groups, however it remains difficult to detect meaningful trends due to a relatively low number of isolates & switch of laboratories to EUCAST guidelines in recent years. Also for *Acinetobacter* spp (including *A baumannii*), the number of labs submitting results of blood/cerebrospinal fluid isolates should further increase to improve trend detection.

Despite all efforts done by participating laboratories and Sciensano, a database with only minimal (hospital laboratories) or insufficient (non-hospital laboratories) representativeness could be obtained, with resistance indicators also being insufficiently precise for pathogens such as *P aeruginosa* and *Acinetobacter* spp. Because these issues persist since several years, it should be noted that EARS-BE data collection proceeds without any official regulation nor funding, not on the level of participating laboratories nor of Sciensano. The current COVID19 crisis did further highlight this structural lack of resources, by emphasizing even more the efforts needed to obtain qualitative and representative data from laboratories in timely fashion as well as to organize the follow-up & analysis of this project within Sciensano. This lack of structure and funding is in contradiction with international recommendations to organize national surveillance of AMR up to the level of the susceptibility test, as done by EARS-NET surveillance (coordinated by ECDC) and the Global antimicrobial surveillance system (GLASS, under coordination by World Health Organization[6]). It is also in contradiction with the 2013 MDRO plan[7], which called for extension of current national AMR surveillance towards the non-hospital environment. In recent years, the EARSBE surveillance has tried to answer these calls, both by extending its scope to urine sample as well as to non-hospital laboratories, but the current crisis shows that structural funding and prioritization is needed to improve data representativeness and quality as well as reporting delays.

National AMR surveillance in BE is organized through the Royal Decree for funding of acute care hospitals[8], the current version of which is restricted and prioritized on the surveillances of MRSA, Gram-negative bacteria, and VRE. Because these all proceed by data collection of hospital-aggregated indicators, they are incompatible with AST-level AMR surveillance such as EARS-NET or GLASS. Modification of this legislation to include and prioritize AST-level AMR surveillance is therefore a first important step, even if this will not acknowledge calls to

establish AMR surveillance within the non-hospital sector. In 2019, a harmonized data collection protocol[9] was proposed for the EARS-BE and the AMR national surveillances (ie for harmonized collection of 2019 data), its main objectives being to improve the quality of data for AMR national surveillances collecting detailed antimicrobial susceptibility tests (AST) data instead of aggregated data, to reduce workload for laboratories, and to increase the number of participants to the EARS-BE project. Unfortunately, due to the pressure caused by the COVID-19 crisis in the laboratories, insufficient participation was recorded to the pilot phase of this protocol, therefore it will be repeated for the 2020 data collections.

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