TESSy - The European Surveillance System

Antimicrobial resistance (AMR) reporting protocol 2023

European Antimicrobial Resistance Surveillance Network (EARS-Net) surveillance data for 2022

March 2023

Contents

Introduction

This reporting protocol is for the 2023 data call for antimicrobial resistance (AMR) surveillance data collected by the European Antimicrobial Resistance Surveillance Network (EARS-Net) for 2022.

The Reporting Protocols are data collection guidelines for reporting countries' data managers, and the Reporting Protocol design is intended to improve user-friendliness by:

- Introducing a uniform structure to make it easier for data managers to find data collection information across different subjects.
- Removing information not relevant to data managers.

The Reporting Protocols are supplemented by the *Technical Annex*, which contains updated generic information for each data collection.

Likewise, the Surveillance Protocol will contain some of the generic information previously contained in the Reporting Protocols.

Because reporting countries' data managers sometimes play multiple roles, it is sometimes relevant to distribute subject-specific material together with a Reporting Protocol. To maintain the uniform structure, this sort of material is now included in *Annex 2*.

How to use this document

This Reporting Protocol provides information for reporting countries' data managers in three main sections:

- *Reporting to TESSy* – contains guidelines on how to prepare data for submission to TESSy, deadlines, subject-specific information (e.g. new changes to metadata), and links to further information.
- *Annex 1* – contains:
    - The metadata set for the subject(s) covered by this Reporting Protocol.
    - A history of metadata changes for the subject(s) covered by this Reporting Protocol.
- *Annex 2* – contains subject-specific material relevant for distribution with the Reporting Protocol.

Finding further information

Paragraphs denoted by the information icon tell where you can find further information.

Updated links to all the schedules, documentation and training materials mentioned in this Reporting Protocol are included in the *Technical Annex*, including links to:

- Metadata sets and history.
- Tutorials for data transformation using respectively Excel and Access.
- TESSy user documentation.
- CSV and XML transport protocols.

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Reporting to TESSy

This section provides both an overview of the TESSy reporting process and tips on where you can find useful information.

The overall process is:

1. *Familiarise yourself with the data collection deadlines*.
2. *Prepare (export and transform) your data*.
3. *Check that your data complies with the metadata*.
4. *Check that your data source profile is up-to-date*.
5. *Submit your file(s) to TESSy*.
6. *Finalise and approve your submission*.

Checking the data collection schedule

An updated link to the current data collections schedule is provided in the *Technical Annex*.

Preparing data

After you have exported the data from your national database, you need to ensure that the data are in a format that TESSy can accept. This applies both to the type of file submitted to TESSy (only CSV and XML files can be submitted) and to the format of the data in certain fields.

Tutorials covering how you can transform your data to the correct TESSy format using Excel or Access are available on the TESSy documents website. Information on the file formats is available in the CSV Transport Protocol and XML Transport Protocol.

AMR-specific guidelines for data collection and preparation for TESSy are provided in *Annex 1* and *Annex 2*.

Checking metadata

The TESSy metadata define the fields and data formats that are valid as input to TESSy for a given subject.

As requirements to the data to be shared among TESSy users change, the data changes needed to support the new requirements are identified and agreed upon between the National Surveillance Contact Points, the Network Coordination Groups and ECDC's Disease Experts, and then implemented as changes to the TESSy metadata.

In order to ensure that your data can be saved correctly in TESSy, you therefore need to check that your data are correctly formatted according to the most recent metadata set.

Changes to the metadata for the subject of this Reporting Protocol are described in:

- *Changes to current metadata* – changes since the last Reporting Protocol.
- *Annex 1* – preceding changes.

It is especially important to focus on:

- **Field formats**

  Many fields require that data are formatted in a specific way. For example, dates must be in the YYYY-MM-DD format; dates in the DD/MM/YYYY format will be rejected.

- **Coded values**

  Some fields only permit the use of specific values (coded values). For example, **M**, **F**, **UNK**, or **Other** are the coded values for *Gender* and any other value in a *Gender* field will be rejected.

A single metadata set file contains all the definitions and rules you need to comply with to format your data correctly for every subject (usually a disease). The file can be downloaded as an Excel file from the TESSy documents website.

By filtering the fields in the file by subject, you can see the fields required for your subject and the rules applying to these fields.

The *Technical Annex* provides an overview of how you work with the metadata file, and the TESSy user documentation provides in-depth details on metadata.

Checking your data source profile

Before submitting your file(s), please review the profile for your data source(s) in TESSy (go to **Data Sources**), and update the information, if necessary.

Complete and up-to-date data source information for each subject is important for improving interpretation of data - each surveillance system has different features that need to be taken into account when comparing data at an international level.

If your data source information is out-of-date and you do not have access rights to update it, please request your National Focal Point for Surveillance or National Coordinator to do so.

In-depth information on the data source variables is available in the TESSy user documentation.

Submitting your data

Data is submitted through the TESSy web interface (go to **Upload**).

The *Technical Annex* provides an overview of how you submit files to TESSy, and the TESSy user documentation provides in-depth descriptions of all the upload methods.

Finalising your submission

The compliance of your data with the validation rules in the metadata is checked automatically during the data upload process.

The result of your upload – i.e. rejected or validated – is displayed immediately after the conclusion of the check in the **Validation details** webpage. Please review the result carefully:

- If your file has been rejected, there will be a message explaining each instance of non-compliance with the metadata that you need to correct.
- If your file has been validated, there might be warnings and remarks relating to possible data quality issues or to potential overwriting of existing records that you should consider.

When your file has been validated and you are satisfied that all corrections have been made, please ensure prompt approval – unapproved uploads can block for the approval of other uploads.

The TESSy user documentation provides information on reviewing validation results and adjusting reporting periods to avoid overwriting existing records.

TESSy HelpDesk

Email:	*TESSy@ecdc.europa.eu*
Telephone number:	**+46-(0)8-5860 1601**
Availability:	9:00 – 16:00 Stockholm time, Monday to Friday (except ECDC Holidays)

Changes to current AMR metadata

AMRTEST: The coded value list for ResultMICSign, and ResultEtestSign was updated and now only contains: <= : Less than or equal; = : Equal; > : Greater than; >= : Greater than or equal.

AMRTEST: The variable ResultZoneSign, was removed from reporting.

AMRTEST: A validation rule was added to the variable ResultZoneValue; Acceptable values: 0-50.

AMRTEST: The variable ResultEtestSign was renamed ResultGradSign.

AMRTEST: The variable ResultEtestValue was renamed ResultGradValue.

AMRTEST: The variable ResultEtestSIR was renamed ResultGradSIR.

Metadata changes to AMRTEST and AMRCOVER are described in *Annex 1*.

Information on changes to the metadata for other subjects is available on the TESSy documentation website.

Annex 1 AMR metadata

This section describes:

- *The AMR metadata set*
- *Changes to the AMR metadata*

AMR metadata set

The AMR metadata is described in two sections:

- *Overview of EARS-Net AMR surveillance metadata*
- *Isolate-based reporting*
- *Coverage and representativeness*

Overview of EARS-Net AMR surveillance metadata

The metadata set for **isolate-based AMR reporting** (RecordType **AMRTEST**) consists of 8 technical variables and 28 epidemiological variables, which are further classified as variables at the patient/isolate level and variables at the AMR test level. The first level includes data referring to the isolate which are repeated in all records reporting the antimicrobial susceptibility tests performed for that isolate (See the following table).

The variables used for **reporting coverage and representativeness** (RecordType **AMRCOVER**) according to aggregated format include: RecordType; RecordTypeVersion; Subject; DataSource; ReportingCountry; DateUsedForStatistics; SameMicrSampleCov; Pathogen; PropPopulationLabCov; PopGeoReprCov; NumBedsHospCov; NumPatDaysHospCov; HospitalReprCov; NumCultureSetsHospCov; NumPatDaysForRateCov; IsolateMicroRepr.

The variables of **AMRTEST** and **AMRCOVER** RecordTypes are described in more detail, including the validation rules, in *Isolate-based reporting* and *Coverage and representativeness*.

Current record type versions

Table 1 shows the record type versions to be used when reporting 2022 AMR surveillance data to TESSy.

Table 1: AMR record version types for 2022 data

Record type	Record type version
AMRCOVER	AMRCOVER.v2
AMRTEST	AMRTEST.3

Isolate-based reporting

The following set of variables applies for isolate-based reporting of AMR. The dataset is sub-divided into a common set of system related variables (technical variables) and epidemiological variables. The epidemiological variables can be classified in two levels: isolate information and susceptibility test information. The first level includes data referring to the specific isolate, which are repeated for each antimicrobial agent for which the susceptibility of that isolate has been tested.

The variables are described in the following tables:

- Table 2: Technical variables
- Table 3: Epidemiological variables at isolate level
- Table 4: Epidemiological variables at AMR test level

Variables #1,2,4,5,6,7,9,10,11,18,25,26 are technically mandatory; TESSy will not accept the data submission unless these fields have been completed.

However, if you enter data that does not meet the requested combination of "Pathogen" and "Antibiotic", the record is ignored but the batch is NOT rejected. By ignored, TESSy does not insert the data for this record into the database. The ignored records are kept as original data but are not available for analysis or report.

Table 2: Technical variables

VariableName	**1 – RecordID**
Description	Unique anonymised identifier for each record within and across the national surveillance system and subject – selected and generated by reporting country. Recommended format: "[ReportingCountry][LaboratoryCode] [Patient Counter][Pathogen] [Specimen][Antibiotic][DateUsedForStatistics]"
Required (what happens if not submitted)	Yes (Error)
Data type	String (Max length: 80)
VariableName	**2 - RecordType**
Description	Structure and format of the data.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	AMRTEST
VariableName	**3 – RecordTypeVersion**
Description	There may be more than one version of a RecordType. This element indicates which version the sender uses when generating the message. Required when no metadata set is provided at upload.
Required	No
Data type	Numeric
Code	See Metadata
VariableName	**4 - Subject**
Description	Subject of the data to report.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	AMR
VariableName	**5 – DataSource**
Description	The data source (surveillance system) that the record originates from.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	See Metadata
VariableName	**6 – ReportingCountry**
Description	The country reporting the record.

Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	See Metadata
VariableName	**7 – DateUsedForStatistics**
Description	The reference date used for standard reports that is compared to the reporting period. Recommended: Date when sample was taken.
Required (what happens if not submitted)	Yes (Error)
Data type	Date
Code	Exact date only, "YYYY-MM-DD"
VariableName	**8 – Status**
Description	Status of reporting NEW/UPDATE or DELETE (inactivate). Default if left out: NEW/UPDATE. If set to DELETE, the record with the given RecordID will be deleted from the TESSy database (or better stated, invalidated). If set to NEW/UPDATE or left empty, the record is newly entered into the database.
Required	No
Data type	Coded Value
Code	NEW/UPDATE or DELETE

Table 3: Epidemiological variables at isolate level

VariableName	**9 - LaboratoryCode**
Description	Laboratory code unique for each laboratory within the country.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	See Metadata If a country has a need for additional codes in the list, they must contact TESSy Helpdesk to get the code added. Recommended format: [ReportingCountry]-[code of three characters]
VariableName	**10 – Specimen**
Description	Isolate source The source of the isolate (i.e. blood or cerebrospinal fluid)
Required	Yes (Error)
Data type	Coded Value
Code	BLOOD = blood CSF = Cerebrospinal fluid
VariableName	**11 – PatientCounter**
Description	Numeric Code for each patient, unique within lab. Anonymous code by lab to specify patient.
Required (what happens if not submitted)	Yes (Error)
Data type	Numeric
Code	Require that the labs anonymise the PatientCounter.

VariableName	**12 – Gender**
Description	Gender
Required (what happens if not submitted)	Yes (Warning)
Data type	Coded Value
Code	M = Male F = Female O = Other UNK = Unknown
VariableName	**13 - Age**
Description	Age of the patient when the sample was taken.
Required (what happens if not submitted)	Yes (Warning)
Data type	Numeric
Code	Integer
VariableName	**14 – IsolateId**
Description	Isolate ID; Code for each isolate, unique within lab and year. Text code assigned by lab to specify isolate.
Required (what happens if not submitted)	Yes (Warning)
Data type	Text
VariableName	**15 – HospitalId**
Description	Unique identifier for the hospital within each laboratory.
Required (what happens if not submitted)	Yes (Warning)
Data type	Text
Code	Unique identifier for the hospital within each laboratory. Recommended format: [LaboratoryCode]-[letter assigned to a hospital – starting from A, B, C, etc.]
VariableName	**16 – PatientType**
Description	Origin of patient. Is the patient at the moment the sample is taken admitted in a hospital (inpatient), or not (outpatient). Patients that go to the hospital for dialysis or other types of day hospital care should be classified as “O” for the field “PatientType”. All other patients that are admitted in the hospital as inpatients should be classified as “INPAT”.
Required (what happens if not submitted)	Yes (Warning)
Data type	Coded Value
Code	INPAT=Admitted (Inpatient) OUTPAT=Outpatient (e.g. emergency room) O=Other UNK=Unknown
VariableName	**17 – HospitalUnitType**
Description	Hospital department (at time of sample collection)

Required (what happens if not submitted)	Yes (Warning)
Data type	Coded Value
Code	INTMED=Internal Medicine PEDS=Paediatrics/neonatal PEDSICU=Paediatrics/neonatal ICU SURG=Surgery ONCOL=Haematology/Oncology OBGYN=Obstetrics/Gynaecology ICU=Intensive Care Unit ED=Emergency Department URO=Urology Ward INFECT=Infectious Disease Ward O=Other UNK=Unknown
VariableName	**18 – Pathogen**
Description	Pathogen Species and genus of the pathogen which has been isolated from the sample.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	STRPNE=*Streptococcus pneumoniae* STAAUR=*Staphylococcus aureus* ENCFAE=*Enterococcus faecalis* ENCFAI=*Enterococcus faecium* ESCCOL=*Escherichia coli* KLEPNE=*Klebsiella pneumoniae* PSEAER=*Pseudomonas aeruginosa* ACISPP=*Acinetobacter* species
VariableName	**19 - DateOfHospitalisation**
Description	Date of admission in hospital
Required	No
Data type	Date
Code	Exact date only, “YYYY-MM-DD”
VariableName	**20 – ResultPCRmec**
Description	Detection of PCR *mecA* gene
Required	No
Data type	Coded Value
Code	POS=positive NEG=negative UNK=unknown
Validation rule	To be reported only if Pathogen=STAAUR.
VariableName	**21 - ResultPbp2aAggl**
Description	Detection of PBP2a-agglutination
Required	No
Data type	Coded Value

Code	POS=positive NEG=negative UNK=unknown
Validation rule	To be reported only if Pathogen=STAAUR.
VariableName	**22 – Serotype**
Description	Serotype/group of the pathogen isolated from the sample.
Required	No
Data type	Coded Value
Code	See Metadata
Validation rule	To be reported only if Pathogen=STRPNE.
VariableName	**23 – ESBL**
Description	Detection of Extended-Spectrum Beta-Lactamase
Required	No
Data type	Coded Value
Code	POS=positive NEG=negative UNK=unknown
Validation rule	To be reported only if Pathogen=ESCCOL or KLEPNE.
VariableName	**24 – ResultCarbapenemases**
Description	Detection of Carbapenemase
Required	No
Data type	Coded Value
Code	POS=positive NEG=negative UNK=unknown
Validation rule	To be reported only if Pathogen=ESCCOL or KLEPNE or PSEAER or ACISPP

Table 4: Epidemiological variables at AMR test level

VariableName	**25 – Antibiotic**
Description	Antimicrobial code
Required	Yes (Ignore): data entry is required. However, if you enter data that does not meet the requested combination of "Pathogen" and "Antibiotic", the record is ignored but the batch is NOT rejected. By ignored, we mean that TESSy does not insert the data for this record into the database. The ignored records are kept as original data but are not available for analysis or report.
Data type	Coded Value
Code	See *Implementation of AMR case definitions for TESSy* where a list of all antimicrobial agent codes is provided
VariableName	**26 – SIR**

Description	Final result of interpretation of all different susceptibility tests performed, based on EUCAST breakpoints. Starting with data collected for 2019, the updated EUCAST definitions of susceptibility testing categories are used: S - Susceptible, standard dosing regimen: A microorganism is categorised as "Susceptible, standard dosing regimen", when there is a high likelihood of therapeutic success using a standard dosing regimen of the agent. I – Susceptible, increased exposure: A microorganism is categorised as "Susceptible, increased exposure" when there is a high likelihood of therapeutic success because exposure to the agent is increased by adjusting the dosing regimen or by its concentration at the site of infection. R - Resistant: A microorganism is categorised as "Resistant" when there is a high likelihood of therapeutic failure even when there is increased exposure.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	S=Susceptible, standard dosing regimen I=Susceptible, increased exposure R=Resistant
VariableName	**27 – ResultZoneValue**
Description	Zone (Value in mm)
Required	No
Data type	Numeric
Code	Integer
VariableName	**28 – ResultZoneSIR**
Description	Interpretation of the zone test.
Required	No
Data type	Coded Value
Code	S=Susceptible, standard dosing regimen I=Susceptible, increased exposure R=Resistant
VariableName	**29 – ResultMICSign**
Description	MIC (> < =) This field can indicate if a MIC-value of the exact value "equal to" (=);“equal to or less than” the value (<=value);"greater than" the value (>value); or “equal to or greater than” the value (>=value). The value is indicated in the following field.
Required	No
Data type	Coded Value
Code	<= = >= >

VariableName	**30 – ResultMICValue**
Description	MIC (Value in mg/L)
Required	No
Data type	Text
Code	If <1 then float, if >=1 then integer
VariableName	**31 – ResultMICSIR**
Description	Interpretation of the MIC test.
Required	No
Data type	Coded Value
Code	S=Susceptible, standard dosing regimen I=Susceptible, increased exposure R=Resistant
VariableName	**32 – ResultGradSign**
Description	Gradient strip (> < =) This field can indicate if a value of the zone diameter of the gradient strip is the exact value "equal to" (=); "equal to or less than" the value (<= value); "greater than" the value (>value); or "equal to or greater than" the value (>=value). The value is indicated in the following field.
Required	No
Data type	Coded Value
Code	<= = >= >
VariableName	**33 - ResultGradValue**
Description	Gradient strip value (Value in mg/L)
Required	No
Data type	Text
Code	If <1 then float, if >=1 then integer. The value 1.5 is also allowed.
VariableName	**34 – ResultGradSIR**
Description	Interpretation of the gradient strip test.
Required	No
Data type	Coded Value
Code	S=Susceptible, standard dosing regimen I=Susceptible, increased exposure R=Resistant
VariableName	**35 – DiskLoad**
Description	Disk content (only if Zone) This field can be used to mention the load of the antimicrobial disk used. Please mention the value and the Units (e.g. mcg, Units or IU).
Required	No
Data type	Text

Code	Value and units: i.e. UI, mcg.
VariableName	**36 - ReferenceGuidelinesSIR**
Description	Starting with data collected for 2019, only EUCAST clinical guidelines are accepted. The variable is kept to enable data validation.
Required	No
Data type	Coded value
Code	EUCAST=European Committee on Antimicrobial Susceptibility Testing CLSI=Clinical and Laboratory Standards Institute NAT=National O=Other

Coverage and representativeness

The following set of variables applies for country aggregate reporting of coverage and representativeness of laboratories participating in EARS-Net. The dataset is sub-divided into a common set of system related variables (technical variables) and epidemiological variables. The epidemiological variables must be provided at microorganism level if coverages and representativeness differ by species. Otherwise, if coverage and representativeness are the same for all species, one AMRCOVER record per DataSource and year is expected.

The variables are described in the following tables:

- Table 5: Technical variables
- Table 6: Epidemiological variables

Variables #1,3,4,5,6,7,8,9,10,13,16 are technically mandatory; TESSy will not accept the data submission unless these fields have been completed.

Table 5: Technical variables

VariableName	**1 – RecordType**
Description	Structure and format of the data.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	AMRCOVER
VariableName	**2 – RecordTypeVersion**
Description	There may be more than one version of a Record Type. This element indicates which version the sender uses when generating the message. Required when no metadata set is provided at upload.
Required	No
Data type	Numeric
Code	See Metadata
VariableName	**3 – Subject**
Description	Subject of data to report.
Required (what happens if not submitted)	Yes (Error)

Data type	Coded Value
Code	AMRCOVER
VariableName	**4 – DataSource**
Description	The data source (surveillance system) that the record originates from.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	See Metadata
VariableName	**5 – ReportingCountry**
Description	The country reporting the record.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	See Metadata
VariableName	**6 – DateUsedForStatistics**
Description	The reference year for which the data are valid.
Required (what happens if not submitted)	Yes (Error)
Data type	Date
Code	"YYYY"

Table 6: Epidemiological variables

VariableName	**7 - SameMicrSampleCov**
Description	Estimated coverages and representativeness are the same for all microorganism species under surveillance. If coverages and representativeness are the same for all microorganism species, one AMRCOVER record per DataSource and year is expected (the code "PATAMR" should be used for the variable "Pathogen"). If coverages and representativeness differ by species, eight AMRCOVER records per DataSource and year are expected (all codes other than "PATAMR" should be used for the variable "Pathogen").
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	Y=Yes N=No
VariableName	**8 – Pathogen**
Description	Pathogen. The code "PATAMR" should be used if coverage is the same for all pathogens. The other eight codes are specific for each microorganism under surveillance.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value

Code	PATAMR=All EARS-Net pathogens (to be used if coverage is the same for all pathogens) STRPNE=*Streptococcus pneumoniae* STAAUR=*Staphylococcus aureus* ENCFAE=*Enterococcus faecalis* ENCFAI=*Enterococcus faecium* ESCCOL=*Escherichia coli* KLEPNE=*Klebsiella pneumoniae* PSEAER=*Pseudomonas aeruginosa* ACISPP=*Acinetobacter* species
VariableName	**9 – PropPopulationLabCov**
Description	Best available estimate for the proportion of the national population covered by the laboratories reporting to EARS-Net in the specific year. Use '.' as decimal delimiter, e.g. 0.32.
Required (what happens if not submitted)	Yes (Error)
Data type	Text
Code	Float
VariableName	**10 – PopGeoReprCov**
Description	Population sample geographical representativeness.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	HIGH=all main geographical regions of the country are covered; MEDIUM=most geographical regions of the country are covered; LOW=only a few geographical areas of the country are covered.
VariableName	**11 – NumBedsHospCov**
Description	Total number of beds of hospitals served by laboratories reporting to EARS-Net.
Required (what happens if not submitted)	No
Data type	Numeric
Code	Integer
VariableName	**12 – NumPatDaysHospCov**
Description	Total number of patient-days of hospitals served by laboratories reporting to EARS-Net.
Required (what happens if not submitted)	Yes (Warning)
Data type	Numeric
Code	Integer
VariableName	**13 – HospitalReprCov**
Description	Hospital sample representativeness.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value

Code	HIGH=the hospital sample is representative of the acute care hospital distribution in the country; MEDIUM=the hospital sample is partly representative of the acute care hospital distribution in the country; LOW=the hospital sample is poorly representative of the acute care hospital distribution in the country.
VariableName	**14 – NumCultureSetsHospCov**
Description	Total number of blood culture sets taken in hospitals served by laboratories reporting to EARS-Net and sent to these laboratories. The provided data should be suitable for calculating the blood culture rate in the specific year: number of sets refers to the hospital sample for which the aggregated denominator (NumPatDaysForRateCov) is provided.
Required (what happens if not submitted)	Yes (Warning)
Data type	Numeric
Code	Integer
VariableName	**15 – NumPatDaysForRateCov**
Description	Total number of patient-days of hospitals served by laboratories which provided the Number of blood culture sets taken. This number can be equal to "NumPatDaysHospCov" or lower if only part of the laboratories provided the number of blood culture sets taken in hospitals served by laboratories reporting to EARS-Net and sent to these laboratories.
Required (what happens if not submitted)	Yes (Warning)
Data type	Numeric
Code	Integer
VariableName	**16 – IsolateMicroRepr**
Description	Isolate sample invasive infection causing microorganism representativeness.
Required (what happens if not submitted)	Yes (Error)
Data type	Coded Value
Code	HIGH=the isolate sample is representative of microorganisms causing invasive infections in the included hospitals; MEDIUM=the isolate sample is partly representative of microorganisms causing invasive infections in the included hospitals; LOW=the isolate sample is poorly representative of microorganisms causing invasive infections in the included hospitals.

AMR metadata change history

Metadata changes prior to 2014 can be found on the TESSy documents website.

Previous metadata changes

Table 7: Summary of implemented changes in AMRTEST and AMRCOVER record types for Antimicrobial Resistance (AMR)

Year	Subject	Description
2023	**AMRTEST**	The coded value list for ResultMICSign, and ResultEtestSign was updated and now only contains: <= : Less than or equal; = : Equal; > : Greater than; >= : Greater than or equal. The variable ResultZoneSign, was removed from reporting. A validation rule was added to the variable ResultZoneValue; Acceptable values: 0-50. The variable ResultEtestSign was renamed ResultGradSign. The variable ResultEtestValue was renamed ResultGradValue. The variable ResultEtestSIR was renamed ResultGradSIR.
2022	**AMRCOVER**	Variables PopulationReprCov and IsolateReprCov were replaced by PopGeoReprCov and IsolateMicroRepr respectively. PopGeoReprCov, IsolateMicroRepr and HospitalReprCov were given the following value options: High, Medium, Low. The descriptions of variables NumCultureSetsHospCov and NumPatDaysForRateCov were changed.
2021	**AMRTEST**	AMRTEST validation rules were updated in 2021. The validation rules were adjusted to ignore the following combinations: for *E. coli*, NET and POL; for *K. pneumoniae*, NET, POL and TGC; for *P. aeruginosa*, NET, GEN and POL; for *Acinetobacter* spp., NET and POL. 14 July 2021: these changes were retracted in a TESSy metadata to allow for full reporting of data from before 2020.
	AMRTEST	AMRTEST description of the SIR variable was updated in the metadata set. S=Susceptible, standard dosing regimen; and I=Susceptible increased exposure.
2020	**AMRTEST**	Update of validation rules associated to the requested combination of “Pathogen” and “Antibiotic”.
	AMRTEST	Update of validation rules associated to the requested combination of “Pathogen” and “Specimen”.
2019	**AMRCOVER**	The new metadata subject was introduced in place of AMRDENOM.
2018	**AMRDENOM**	The metadata subject was discontinued.
2014	**AMRTEST**	Addition of new codes to coded value list for antibiotics.
	AMRTEST	Update of validation rules associated to these new antibiotics.
	All	Update NUTS codes according to the NUTS Codes 2010 classification from EUROSTAT.

Annex 2 AMR-specific material

Contacts

Questions regarding coding, upload of data etc. should be directed to the *TESSy helpdesk* at *TESSy@ecdc.europa.eu*

Questions regarding the AMR reporting and content will be dealt with by the ECDC EARS-Net contact:

E-mail: *EARS-Net@ecdc.europa.eu*

Questions regarding the use of WHONET to prepare data for TESSy upload can be directed to ECDC contractor **John Stelling:**

E-mail *jstelling@whonet.org* (please keep *EARS-Net@ecdc.europa.eu* in Cc)

Microbiological guidelines for EARS-Net

EARS-Net requires the use of the European Committee on Antimicrobial Susceptibility Testing (EUCAST) guidelines and breakpoints to determine clinical antimicrobial susceptibility (available at *http://www.eucast.org/*). Until 2019, laboratories using other guidelines were also welcomed to report data to EARS-Net but, since 2020, the use of EUCAST has become an essential requirement for participation.

In 2012, the EUCAST steering committee established a subcommittee for detection of resistance mechanisms and specific resistances of clinical and/or epidemiological importance. The sub-committee was established partly in response to frequently asked questions from users of EUCAST guidelines on this issue, and partly on request from the ECDC, as expert microbiology guidance was needed for EARS-Net participants.

The remit of the subcommittee was to develop practical guidelines for detection of specific antimicrobial resistance mechanisms of clinical and/or epidemiological importance. The document was developed by conducting systematic literature searches, and most recommendations are based on multi-centre studies, as these provide the best measure of robustness of the methods. Prior to publication of these guidelines, they were subjected to wide consultation through the EUCAST consultation contact lists, the EUCAST website and ECDC focal point contacts. An updated version of the result of this work can be found in the EUCAST guidelines for detection of resistance mechanisms and specific resistances of clinical and/or epidemiological importance[1].

The guideline describes the definition of the mechanisms of resistances, an outline description of recommended methods of detection, and references to detailed descriptions of the methods for:

1. Carbapenemase-producing Enterobacteriaceae
2. Extended-spectrum β-lactamase (ESBL)-producing Enterobacteriaceae
3. Acquired AmpC β-lactamase-producing Enterobacteriaceae
4. Polymyxin resistance in gram-negative bacilli
5. Carbapenem resistance in *Pseudomonas aeruginosa* and *Acinetobacter*
6. Meticillin-resistant *Staphylococcus aureus* (MRSA)
7. Glycopeptide non-susceptible *Staphylococcus aureus*
8. Vancomycin resistant *Enterococcus faecium* and *Enterococcus faecalis*
9. Penicillin non-wild-type *Streptococcus pneumoniae*

[1]. EUCAST. 2017. EUCAST guidelines for detection of resistance mechanisms and specific resistances of clinical and/or epidemiological importance. Version 2.0 of July 2017 Available at *http://www.eucast.org/fileadmin/src/media/PDFs/EUCAST_files/Resistance_mechanisms/EUCAST_detection_of_resistance_mechanisms_170711.pdf*

Implementation of AMR case definitions for TESSy

Given the typology of data for AMR surveillance, which refers to laboratory isolates rather than to cases of disease, the following case definition has been implemented in the RecordType "AMRTEST", for reporting to TESSy:

The bacterial species under surveillance are:

- *Streptococcus pneumoniae* (STRPNE)
- *Staphylococcus aureus* (STAAUR)
- *Enterococcus faecalis* (ENCFAE)
- *Enterococcus faecium* (ENCFAI)
- *Escherichia coli* (ESCCOL)
- *Klebsiella pneumoniae* (KLEPNE)
- *Pseudomonas aeruginosa* (PSEAER)
- *Acinetobacter* species (ACISPP).

All isolates from blood and/or cerebrospinal fluid for which a susceptibility test has been performed, must be included.

The generic case definition of antibiotic resistance defined in the Commission implementing decision laying down case definitions for reporting communicable diseases to the Community network.[1] EARS-Net requires the use of EUCAST clinical breakpoints in line with the EU case definitions; starting from 2020 (2019 data), countries and laboratories using other guidelines are not eligible to participate in EARS-Net surveillance. Reporting of quantitative susceptibility data is strongly encouraged.

Duplicates from the same patients should be eliminated taking only the first by date of sample collection and isolate source. Table 8 lists all microorganism and antibiotic agent combinations under surveillance by EARS-Net. When, according to the EUCAST guidelines, a specific type of test is to be used, the method is indicated next to the antimicrobial.

If records referring to additional combinations are uploaded, they will be filtered out by the system - see *TESSy Filter 1*.

Table 8: Microorganism and antimicrobial agent combinations under surveillance by EARS-Net (isolates from blood and/or cerebrospinal fluid)

Microorganism	Antimicrobial agent
***Streptococcus pneumoniae* (STRPNE)**	Oxacillin (OXA) – Disk diffusion Penicillin (PEN) – MIC test Clarithromycin (CLR) – MIC test Erythromycin (ERY) Azithromycin (AZM) – MIC test Levofloxacin (LVX) Moxifloxacin (MFX) Norfloxacin (NOR) – Disk diffusion Cefotaxime (CTX) – MIC test Ceftriaxone (CRO) – MIC test
***Staphylococcus aureus* (STAAUR)**	Cefoxitin (FOX) – Disk diffusion Oxacillin (OXA)* – MIC test Levofloxacin (LVX) Ciprofloxacin (CIP) Norfloxacin (NOR) – Disk diffusion

1. Commission Implementing Decision on the communicable diseases and related special health issues to be covered by epidemiological surveillance – Annex 1 (replacing Commission Decision No 2000/96/EC). *Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D0945&from=EN#page=72*

Microorganism	Antimicrobial agent
	Vancomycin (VAN) – MIC test Rifampin (RIF) Linezolid (LNZ) Daptomycin (DAP) – MIC test
Enterococcus faecalis **(ENCFAE)**	Ampicillin (AMP) Amoxicillin (AMX) – MIC test Gentamicin-High (GEH) Vancomycin (VAN) Teicoplanin (TEC) Linezolid (LNZ)
Enterococcus faecium **(ENCFAI)**	Ampicillin (AMP) Amoxicillin (AMX) – MIC test Gentamicin-High (GEH) Vancomycin (VAN) Teicoplanin (TEC) Linezolid (LNZ)
Escherichia coli **(ESCCOL)**	Ampicillin (AMP) Amoxicillin (AMX) – MIC test Amoxicillin-clavulanic acid (AMC) Piperacillin-tazobactam (TZP) Cefotaxime (CTX) Ceftazidime (CAZ) Ceftriaxone (CRO) Cefepime (FEP) Gentamicin (GEN) Tobramycin (TOB) Amikacin (AMK) Ciprofloxacin (CIP) Levofloxacin (LVX) Ofloxacin (OFX) Norfloxacin (NOR)# Moxifloxacin (MFX) Imipenem (IPM) Meropenem (MEM) Ertapenem (ETP) Tigecycline (TGC) Colistin (COL) - Broth microdilution
Klebsiella pneumoniae **(KLEPNE)**	Amoxicillin-clavulanic acid (AMC) Piperacillin-tazobactam (TZP) Cefotaxime (CTX) Ceftazidime (CAZ)

Microorganism	Antimicrobial agent
	Ceftriaxone (CRO) Cefepime (FEP) Gentamicin (GEN) Tobramycin (TOB) Amikacin (AMK) Ciprofloxacin (CIP) Levofloxacin (LVX) Ofloxacin (OFX) Norfloxacin (NOR)# Moxifloxacin (MFX) Imipenem (IPM) Meropenem (MEM) Ertapenem (ETP) Colistin (COL) - Broth microdilution
Pseudomonas aeruginosa **(PSEAER)**	Piperacillin/Tazobactam (TZP) Piperacillin (PIP) Ceftazidime (CAZ) Cefepime (FEP) Tobramycin (TOB) Amikacin (AMK) Ciprofloxacin (CIP) Levofloxacin (LVX) Imipenem (IPM) Meropenem (MEM) Colistin (COL) - Broth microdilution
Acinetobacter **species (ACISPP)**	Gentamicin (GEN) Tobramycin (TOB) Amikacin (AMK) Ciprofloxacin (CIP) Levofloxacin (LVX) Imipenem (IPM) Meropenem (MEM) Colistin (COL) - Broth microdilution

** Meticillin (MET), flucloxacillin (FLC), cloxacillin (CLO) or dicloxacillin (DIC) are accepted as markers for oxacillin (OXA) resistance if oxacillin is not reported.*

 # Please note that ECDC is considering removing norfloxacin from EARS-Net surveillance as of the data collection that will be conducted in 2024. Since 2017, norfloxacin breakpoints have had the note "(uncomplicated UTI only)" in the EUCAST clinical breakpoints.

Objectives for AMR surveillance

Surveillance of AMR within the European Union (EU) has been assured by European law: AMR is listed as a special health issue in the Commission Implementing Decision (EU) 2018/945 of 22 June 2018 on the communicable diseases and related special health issues to be covered by epidemiological surveillance.[1]

EARS-Net is based on a network of representatives from EU/EEA countries collecting routine clinical antimicrobial susceptibility data from national AMR surveillance initiatives. Scientific guidance and support to the network is provided by the EARS-Net Coordination Committee. This group is composed of individual experts selected from among the nominated disease-specific contact points and experts from other organisations that are involved in surveillance of antimicrobial resistance.

The objective of EARS-Net is to collect, analyse and report data on AMR, across EU/EEA countries and as defined in the EARS-Net protocol, to enable action to address AMR. In 2023, EARS-Net collects and analyses 2022 data from the EU/EEA countries.

[1] Decision No 2018/945 of the European Parliament and of the Council of 22 October 2013 on serious cross-border threats to health and repealing Decision No 2119/98/EC.
https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D0945&from=EN

Preparing national AMR datasets

The data collection at laboratory level can be performed both electronically and manually by filling out the corresponding Isolate Records Forms per pathogen (see *Isolate forms*). If the data collection at laboratory level has been performed manually by filling out the Isolate Records, the Country Data Manager should create the fields "Age" and "PatientCounter" starting from the available information in the paper forms ("Year of birth" and "Patient ID / Code").

The data collection for EARS-Net is supported by WHONET (Microbiology Laboratory Database Software) which is a useful tool for processing and analysis of antimicrobial resistance data. It provides a routine procedure to perform data entry and to export data in EARS-Net exchange format and can be used locally by participating laboratories and centrally by country data managers. The software and manual can be downloaded from *http://www.whonet.org/*

If a new laboratory joins the surveillance network the country disease specific contact points must communicate the new code of the new laboratory to the Helpdesk at tessy@ecdc.europa.eu by e-mail before uploading data; otherwise, the system will not recognise the new code and will reject the entire file.

Checking for duplicate records

Before uploading a file to TESSy, the country data manager has to revise the laboratory data and check for duplicates (records with the same RecordId). If there are duplicates, TESSy will reject the upload. Duplicates should be eliminated by merging/selecting records.

Recommendations for selecting records:

- In the TESSy metadata set the recommended format of the RecordId is the combination of the following fields: ReportingCountry; LaboratoryCode; PatientCounter; Pathogen; Specimen; Antibiotic; DateUsedForStatistics.
- According to the metadata set specifications, two or more records with the same RecordId are considered as **duplicates and will generate an error** in the uploading process to TESSy with the subsequent rejection of the entire batch of records.
- To avoid the rejection of the batch, it is important to identify multiple isolates within the same day (DateUsedForStatistics) and select one of them according to the following priority:
    1. If there are duplicates with the same Pathogen and Antibiotic combination but different microbiological tests, select the proper one according to EUCAST guidelines.
    2. If there are duplicates with the same Pathogen, Antibiotic, and microbiological test, but different SIR, select the first in this order R→I→S (thereby the most resistant is selected).
    3. If there are duplicates with the same Pathogen, Antibiotic, microbiological test, and SIR (true duplicates), just select one of them, taking into account the completeness of the other variables.

Data management and analysis

TESSy filter 1 (case definition) and validation report

TESSy filters the uploaded records according to the list of Microorganism/Antimicrobial agent combinations included in the AMR surveillance (the EARS-Net case definition for TESSy is described in more detail in *Implementation of AMR case definitions for TESSy).* Records referring to additional Microorganism/Antimicrobial agent combinations are discharged.

Shortly after the data uploading, TESSy provides a validation report which should be assessed by the country user. The report shows summary statistics of the validated data from the uploaded batch.

TESSy filter 2 (preparing dataset for analysis)

This filter aims to obtain one record per patient/microorganism/specimen/antimicrobial agent combination and year.

STEP 1	Select all records that belong to the **first date** within the considered YEAR for each patient/microorganism combination.	Fields to identify the date: • DateUsedForStatistics Fields to identify the patient/microorganism combination: • ReportingCountry • LaboratoryCode • PatientCounter • Pathogen
STEP 2	If more than **one source** (BLOOD, CSF) is reported within the first date, select only one giving priority to the CSF.	Field to identify the **source**: • Specimen
STEP 3	If the same antimicrobial is still reported in more than one record, make a selection according to the **final interpretation of the susceptibility test** (*priority sequence R→I→S*).	Field to identify the **final interpretation of the susceptibility test**: • SIR
STEP 4	If the same antimicrobial is still reported in more than one record, select the first one.	

Data analysis and presentation

For the analysis, an isolate is considered resistant to an antimicrobial agent when tested and interpreted as resistant (R) according to the EUCAST clinical breakpoint. An isolate of *Streptococcus pneumoniae* is considered penicillin non-wild-type when testing results show oxacillin inhibition zone < 20 mm or benzylpenicillin MIC > 0.06 mg/L. Starting from 2020 (2019 AMR data), results based on interpretive criteria other than EUCAST ones are not accepted in EARS-Net.

As a general rule, data are expressed as a resistance percentage, i.e. the percentage of R isolates out of all isolates with antimicrobial susceptibility testing (AST) information on that specific microorganism–antimicrobial agent combination. In most cases, the percentage resistance is calculated considering an antimicrobial group (instead of a single antimicrobial agent), which needs other specifications to perform the analysis. The group often, but not always, represents an antimicrobial class. An example of an antimicrobial group is the third-generation cephalosporins for *E. coli*. This group contains three antimicrobial agents: ceftriaxone (CRO), cefotaxime (CTX) and ceftazidime (CAZ). If two or more antimicrobials (records) are reported for the same "microorganism/antimicrobial group" combination, count only one of them; the choice has to be done according with the final interpretations of the susceptibility test (field=SIR; priority sequence R→I→S).

Specific rule for *Streptococcus pneumoniae* and penicillin non-wild-type

The antimicrobials considered for this phenotype are penicillin (PEN) and oxacillin (OXA). If both are reported, give priority to penicillin.

Specific rule for *Streptococcus pneumoniae* and fluoroquinolones

The antimicrobials considered for this resistance are norfloxacin (NOR), levofloxacin (LVX) and moxifloxacin (MFX). Priority is given to levofloxacin and moxifloxacin AST results over norfloxacin results.

Specific rule to define Meticillin-resistant *Staphylococcus aureus* (MRSA)

The antimicrobials considered for this resistance are cefoxitin (FOX) and oxacillin (OXA), with priority given to cefoxitin (FOX). AST results for meticillin (MET), flucloxacillin (FLC), cloxacillin (CLO) or dicloxacillin (DIC) are accepted as a marker for oxacillin (OXA) resistance if oxacillin is not reported. Other tests are also considered: PCR *mecA* or PBP2a detection.

Hierarchical levels to assess the MRSA

SIR result of FOX

SIR result of OXA

SIR result of MET, FLC, CLO, DIC

Other test (PCR *mecA* and PBP2a)

When SIR results for FOX, OXA or markers of OXA are not reported, the definition of MRSA is based on the following criteria:

I. If at least one between ResultPCRmec and ResultPbp2aAggl is positive then MRSA.
II. If at least one between ResultPCRmec and ResultPbp2aAggl is negative and the other one is not positive then MSSA (Meticillin-sensitive *Staphylococcus aureus*)

Specific rule for *Staphylococcus aureus* and fluoroquinolones

The antimicrobials considered for this resistance are norfloxacin (NOR), ciprofloxacin (CIP) and levofloxacin (LVX). Priority is given to ciprofloxacin, and/or levofloxacin AST results over norfloxacin results.

The full set of microorganism/antimicrobial group combinations that are under regular surveillance by EARS-Net (routinely presented in an annual report and the ECDC Surveillance Atlas of Infectious Diseases is displayed in Table 9. In addition, additional analysis of other single or group of antimicrobial agents will be performed on an ad hoc basis.

If fewer than 20 isolates are reported for a specific organism–antimicrobial agent combination in a country, the results for this country are not displayed on the maps presented in the Annual Report and the interactive database.

The statistical significance of temporal trends of antimicrobial resistance percentages by country is calculated based on data from the last five years. Countries reporting fewer than 20 isolates per year, where a significant change in data source occurred during the period, or not providing data for all years within the considered period, are not included in the analysis. Statistical significance of trends is assessed by a chi-square test for trend. An additional sensitivity analysis is performed by repeating the test only including laboratories which consistently reported for the full five-year period in order to exclude selection bias when assessing the significance of the trends.

Table 9: Microorganism and antimicrobial group combinations under regular EARS-Net surveillance, 2023

Microorganism	Antimicrobial group	Antimicrobial agents
Streptococcus pneumoniae **(STRPNE)**	Penicillins	PEN, OXA*
	Macrolides	ERY, CLR, AZM
	Fluoroquinolones	NOR, LVX, MFX**
	Third-generation cephalosporins	CTX, CRO
Staphylococcus aureus **(STAAUR)**	MRSA	FOX, OXA***
	Rifampicin	RIF
	Fluoroquinolones	NOR, CIP, LVX****
Enterococcus faecalis **(ENCFAE)**	High-level aminoglycoside resistance	GEH
	Aminopenicillins	AMX, AMP
	Vancomycin	VAN
Enterococcus faecium **(ENCFAI)**	Aminopenicillins	AMX, AMP
	High-level aminoglycoside resistance	GEH
	Vancomycin	VAN
Escherichia coli **(ESCCOL)**	Aminopenicillins	AMX, AMP
	Fluoroquinolones	CIP, OFX, LVX
	Third-generation cephalosporins	CTX, CRO, CAZ
	Aminoglycosides	GEN, TOB
	Carbapenems	IPM, MEM
Klebsiella pneumoniae **(KLEPNE)**	Fluoroquinolones	CIP, OFX, LVX
	Third-generation cephalosporins	CTX, CRO, CAZ
	Aminoglycosides	GEN, TOB
	Carbapenems	IPM, MEM
Pseudomonas aeruginosa **(PSEAER)**	Piperacillin-tazobactam	TZP
	Ceftazidime	CAZ
	Fluoroquinolones	CIP, LVX
	Aminoglycosides	TOB
	Carbapenems	IPM, MEM
Acinetobacter **species (ACISPP)**	Fluoroquinolones	CIP, LVX
	Aminoglycosides	GEN, TOB
	Carbapenems	IPM, MEM

** Priority is given to penicillin susceptibility test over oxacillin results.*

*** Priority is given to levofloxacin and moxifloxacin susceptibility results over norfloxacin results.*

**** Meticillin (MET), flucloxacillin (FLC), cloxacillin (CLO) or dicloxacillin (DIC) susceptibility results are accepted as markers for oxacillin (OXA) resistance if oxacillin is not reported.*

***** Priority is given to ciprofloxacin and levofloxacin susceptibility results over norfloxacin results.*

Isolate record forms

To be filled in by the laboratories without electronic system

The following isolate record forms are included:

- Isolate Record Form *Streptococcus pneumoniae*
- Isolate Record Form *Staphylococcus aureus*
- Isolate Record Form □ *Enterococcus faecium* □ *Enterococcus faecalis*
- Isolate Record Form *Escherichia coli*
- Isolate Record Form *Klebsiella pneumoniae*
- Isolate Record Form *Pseudomonas aeruginosa*
- Isolate Record Form *Acinetobacter* spp.

Isolate Record Form *Streptococcus pneumoniae*

Instructions: Please send data of the first blood and/or cerebrospinal fluid isolate of every patient with an invasive *S. pneumoniae* infection. Send data on resistant and susceptible isolates; use 1 form per isolate.
[n] Indicates variable number in reporting protocol

[9] Laboratory Code		
[14] Isolate Id	**[10] Specimen** ☐ Blood ☐ CSF	**[7] Date of sample collection** (yyyy-mm-dd)
[11] Patient counter	**[12] Gender** ☐ Man ☐ Female ☐ Other ☐ Unknown	**[13] Age** (years)
[15] Hospital Id	**[16] Patient type** ☐ Inpatient ☐ Outpatient ☐ Other ☐ Unknown	**[19] Date of Hospitalisation** (yyyy-mm-dd)
[17] Hospital Unit Type ☐ Internal medicine ☐ Paediatrics/neonatal ☐ Paediatrics/neonatal ICU ☐ Surgery ☐ Haematology/Oncology ☐ Obstetrics/Gynaecology ☐ Intensive care unit ☐ Emergency department ☐ Urology ward ☐ Infectious disease ward ☐ Other ☐ Unknown		

Antibiotic susceptibility testing (S/I/R, zone and/or MIC)

[25] Antibiotic	**[26] SIR** (final interpretation result of all different susceptibility test performed)	**Zone diameter**			**MIC**		**Gradient strip results**		**[36] Reference guidelines**
		[27] Result (mm)	**[28] Interpretation** (SIR)	**[35] Disk load** (specify unit))	**[30] Result** (mg/L)	**[31] Interpretation** (SIR)	**[33] Result** (mg/L)	**[34] Interpretation** (SIR)	Only EUCAST breakpoints accepted
Oxacillin									
Penicillin									
Erythromycin									
Clarithromycin									
Azithromycin									
Cefotaxime									
Ceftriaxone									
Norfloxacin									
Levofloxacin									
Moxifloxacin									
[22] Serotype:									

Send this form to (Name/Institute/Contact details):

Isolate Record Form *Staphylococcus aureus*

Instructions: Please send data of the first blood and/or cerebrospinal fluid isolate of every patient with an invasive *S. aureus* infection. Send data on resistant and susceptible isolates; use 1 form per isolate.
[n] Indicates variable number in reporting protocol

[9] Laboratory Code		
[14] Isolate Id	**[10] Specimen** ☐ Blood ☐ CSF	**[7] Date of sample collection** (yyyy-mm-dd)
[11] Patient counter	**[12] Gender** ☐ Man ☐ Female ☐ Other ☐ Unknown	**[13] Age** (years)
[15] Hospital Id	**[16] Patient type** ☐ Inpatient ☐ Outpatient ☐ Other ☐ Unknown	**[19] Date of Hospitalisation** (yyyy-mm-dd)
[17] Hospital Unit Type ☐ Internal medicine ☐ Paediatrics/neonatal ☐ Paediatrics/neonatal ICU ☐ Surgery ☐ Haematology/Oncology ☐ Obstetrics/Gynaecology ☐ Intensive care unit ☐ Emergency department ☐ Urology ward ☐ Infectious disease ward ☐ Other ☐ Unknown		

MRSA confirmation tests

[20] PCR mec	☐ **Positive** ☐ **Negative** ☐ **Unknown**
[21] Pbp2a agglutination	☐ **Positive** ☐ **Negative** ☐ **Unknown**

Antibiotic susceptibility testing (S/I/R, zone and/or MIC)

[25] Antibiotic	**[26] SIR** (final interpretation result of all different susceptibility test performed)	**Zone diameter**			**MIC**		**Gradient strip results**		**[36] Reference guidelines**
		[27] Result (mm)	**[28] Interpretation** (SIR)	**[35] Disk load** (specify unit))	**[30] Result** (mg/L)	**[31] Interpretation** (SIR)	**[33] Result** (mg/L)	**[34] Interpretation** (SIR)	Only EUCAST breakpoints accepted
Cefoxitin									
Oxacillin									
Ciprofloxacin									
Levofloxacin									
Norfloxacin									
Rifampicin									
Linezolid									
Vancomycin									
Daptomycin									

Send this form to (Name/Institute/Contact details):

Isolate Record Form □ *Enterococcus faecium* □ *Enterococcus faecalis*

Instructions: Please send data of the first blood and/or cerebrospinal fluid isolate of every patient with an invasive *E. faecium/E. faecalis* infection. Send data on resistant and susceptible isolates; use 1 form per isolate.
[n] Indicates variable number in reporting protocol

[9] Laboratory Code		
[14] Isolate Id	**[10] Specimen** ☐ Blood ☐ CSF	**[7] Date of sample collection** (yyyy-mm-dd)
[11] Patient counter	**[12] Gender** ☐ Man ☐ Female ☐ Other ☐ Unknown	**[13] Age** (years)
[15] Hospital Id	**[16] Patient type** ☐ Inpatient ☐ Outpatient ☐ Other ☐ Unknown	**[19] Date of Hospitalisation** (yyyy-mm-dd)
[17] Hospital Unit Type ☐ Internal medicine ☐ Paediatrics/neonatal ☐ Paediatrics/neonatal ICU ☐ Surgery ☐ Haematology/Oncology ☐ Obstetrics/Gynaecology ☐ Intensive care unit ☐ Emergency department ☐ Urology ward ☐ Infectious disease ward ☐ Other ☐ Unknown		

Antibiotic susceptibility testing (S/I/R, zone and/or MIC)

[25] Antibiotic	**[26] SIR** (final interpretation result of all different susceptibility test performed)	**Zone diameter**			**MIC**		**Gradient strip results**		**[36] Reference guidelines**
		[27] Result (mm)	**[28] Interpretation** (SIR)	**[35] Disk load** (specify unit))	**[30] Result** (mg/L)	**[31] Interpretation** (SIR)	**[33] Result** (mg/L)	**[34] Interpretation** (SIR)	Only EUCAST breakpoints accepted
Amoxicillin									
Ampicillin									
Gentamicin - High									
Vancomycin									
Teicoplanin									
Linezolid									

Send this form to (Name/Institute/Contact details):

Isolate Record Form *Escherichia coli*

Instructions: Please send data of the first blood and/or cerebrospinal fluid isolate of every patient with an invasive *E. coli* infection. Send data on resistant and susceptible isolates; use 1 form per isolate.
[n] Indicates variable number in reporting protocol

[9] Laboratory Code		
[14] Isolate Id	**[10] Specimen** ☐ Blood ☐ CSF	**[7] Date of sample collection** (yyyy-mm-dd)
[11] Patient counter	**[12] Gender** ☐ Man ☐ Female ☐ Other ☐ Unknown	**[13] Age** (years)
[15] Hospital Id	**[16] Patient type** ☐ Inpatient ☐ Outpatient ☐ Other ☐ Unknown	**[19] Date of Hospitalisation** (yyyy-mm-dd)
[17] Hospital Unit Type ☐ Internal medicine ☐ Paediatrics/neonatal ☐ Paediatrics/neonatal ICU ☐ Surgery ☐ Haematology/Oncology ☐ Obstetrics/Gynaecology ☐ Intensive care unit ☐ Emergency department ☐ Urology ward ☐ Infectious disease ward ☐ Other ☐ Unknown		

Phenotypic detection of resistance

[23] ESBL	☐ **Positive** ☐ **Negative** ☐ **Unknown**
[24] Carbapenemase	☐ **Positive** ☐ **Negative** ☐ **Unknown**

Antibiotic susceptibility testing (S/I/R, zone and/or MIC)

[25] Antibiotic	**[26] SIR** (final interpretation result of all different susceptibility test performed)	**Zone diameter**			**MIC**		**Gradient strip results**		**[36] Reference guidelines**
		[27] Result (mm)	**[28] Interpretation** (SIR)	**[35] Disk load** (specify unit)	**[30] Result** (mg/L)	**[31] Interpretation** (SIR)	**[33] Result** (mg/L)	**[34] Interpretation** (SIR)	Only EUCAST breakpoints accepted
Amoxicillin									
Ampicillin									
Amoxicillin-clavulanic acid									
Piperacillin – tazobactam									
Gentamicin									
Tobramycin									
Amikacin									
Ciprofloxacin									
Ofloxacin									
Levofloxacin									
Moxifloxacin									
Norfloxacin									
Cefotaxime									
Ceftriaxone									
Ceftazidime									
Cefepime									
Imipenem									
Meropenem									
Ertapenem									
Colistin									
Tigecycline									

Send this form to (Name/Institute/Contact details):

Isolate Record Form *Klebsiella pneumoniae*

Instructions: Please send data of the first blood and/or cerebrospinal fluid isolate of every patient with an invasive *K. pneumoniae* infection. Send data on resistant and susceptible isolates; use 1 form per isolate.
[n] Indicates variable number in reporting protocol

[9] Laboratory Code		
[14] Isolate Id	**[10] Specimen** ☐ Blood ☐ CSF	**[7] Date of sample collection** (yyyy-mm-dd)
[11] Patient counter	**[12] Gender** ☐ Man ☐ Female ☐ Other ☐ Unknown	**[13] Age** (years)
[15] Hospital Id	**[16] Patient type** ☐ Inpatient ☐ Outpatient ☐ Other ☐ Unknown	**[19] Date of Hospitalisation** (yyyy-mm-dd)
[17] Hospital Unit Type ☐ Internal medicine ☐ Paediatrics/neonatal ☐ Paediatrics/neonatal ICU ☐ Surgery ☐ Haematology/Oncology ☐ Obstetrics/Gynaecology ☐ Intensive care unit ☐ Emergency department ☐ Urology ward ☐ Infectious disease ward ☐ Other ☐ Unknown		

Phenotypic detection of resistance

[23] ESBL	☐ Positive ☐ Negative ☐ Unknown
[24] Carbapenemase	☐ Positive ☐ Negative ☐ Unknown

Antibiotic susceptibility testing (S/I/R, zone and/or MIC)

[25] Antibiotic	**[26] SIR** (final interpretation result of all different susceptibility test performed)	**Zone diameter**			**MIC**		**Gradient strip results**		**[36] Reference guidelines**
		[27] Result (mm)	**[28] Interpretation** (SIR)	**[35] Disk load** (specify unit)	**[30] Result** (mg/L)	**[31] Interpretation** (SIR)	**[33] Result** (mg/L)	**[34] Interpretation** (SIR)	Only EUCAST breakpoints accepted
Amoxicillin clavulanic acid									
Piperacillin – tazobactam									
Gentamicin									
Tobramycin									
Amikacin									
Ciprofloxacin									
Ofloxacin									
Levofloxacin									
Norfloxacin									
Moxifloxacin									
Cefotaxime									
Ceftriaxone									
Ceftazidime									
Cefepime									
Imipenem									
Meropenem									
Ertapenem									
Colistin									

Send this form to (Name/Institute/Contact details):

Isolate Record Form *Pseudomonas aeruginosa*

Instructions: Please send data of the first blood and/or cerebrospinal fluid isolate of every patient with an invasive *P. aeruginosa* infection. Send data on resistant and susceptible isolates; use 1 form per isolate.
[n] Indicates variable number in reporting protocol

[9] Laboratory Code		
[14] Isolate Id	**[10] Specimen** ☐ Blood ☐ CSF	**[7] Date of sample collection** (yyyy-mm-dd)
[11] Patient counter	**[12] Gender** ☐ Man ☐ Female ☐ Other ☐ Unknown	**[13] Age** (years)
[15] Hospital Id	**[16] Patient type** ☐ Inpatient ☐ Outpatient ☐ Other ☐ Unknown	**[19] Date of Hospitalisation** (yyyy-mm-dd)
[17] Hospital Unit Type ☐ Internal medicine ☐ Paediatrics/neonatal ☐ Paediatrics/neonatal ICU ☐ Surgery ☐ Haematology/Oncology ☐ Obstetrics/Gynaecology ☐ Intensive care unit ☐ Emergency department ☐ Urology ward ☐ Infectious disease ward ☐ Other ☐ Unknown		

Phenotypic detection of resistance

[24] Carbapenemase	☐ **Positive** ☐ **Negative** ☐ **Unknown**

Antibiotic susceptibility testing (S/I/R, zone and/or MIC)

[25] Antibiotic	**[26] SIR** (final interpretation result of all different susceptibility test performed)	**Zone diameter**			**MIC**		**Gradient strip results**		**[36] Reference guidelines**
		[27] Result (mm)	**[28] Interpretation** (SIR)	**[35] Disk load** (specify unit))	**[30] Result** (mg/L)	**[31] Interpretation** (SIR)	**[33] Result** (mg/L)	**[34] Interpretation** (SIR)	Only EUCAST breakpoints accepted
Piperacillin									
Piperacillin-tazobactam									
Tobramycin									
Amikacin									
Ciprofloxacin									
Levofloxacin									
Ceftazidime									
Cefepime									
Imipenem									
Meropenem									
Colistin									

Send this form to (Name/Institute/Contact details):

Isolate Record Form *Acinetobacter* species

Instructions: Please send data of the first blood and/or cerebrospinal fluid isolate of every patient with an invasive *Acinetobacter* spp. infection. Send data on resistant and susceptible isolates; use 1 form per isolate.
[n] Indicates variable number in reporting protocol

[9] Laboratory Code		
[14] Isolate Id	**[10] Specimen** ☐ Blood ☐ CSF	**[7] Date of sample collection** (yyyy-mm-dd)
[11] Patient counter	**[12] Gender** ☐ Man ☐ Female ☐ Other ☐ Unknown	**[13] Age** (years)
[15] Hospital Id	**[16] Patient type** ☐ Inpatient ☐ Outpatient ☐ Other ☐ Unknown	**[19] Date of Hospitalisation** (yyyy-mm-dd)
[17] Hospital Unit Type ☐ Internal medicine ☐ Paediatrics/neonatal ☐ Paediatrics/neonatal ICU ☐ Surgery ☐ Haematology/Oncology ☐ Obstetrics/Gynaecology ☐ Intensive care unit ☐ Emergency department ☐ Urology ward ☐ Infectious disease ward ☐ Other ☐ Unknown		

Phenotypic detection of resistance

[24] Carbapenemase	☐ **Positive** ☐ **Negative** ☐ **Unknown**

Antibiotic susceptibility testing (S/I/R, zone and/or MIC)

[25] Antibiotic	**[26] SIR** (final interpretation result of all different susceptibility test performed)	**Zone diameter**			**MIC**		**Gradient strip results**		**[36] Reference guidelines**
		[27] Result (mm)	**[28] Interpretation** (SIR)	**[35] Disk load (specify unit)**	**[30] Result** (mg/L)	**[31] Interpretation** (SIR)	**[33] Result** (mg/L)	**[34] Interpretation** (SIR)	Only EUCAST breakpoints accepted
Ciprofloxacin									
Levofloxacin									
Gentamicin									
Tobramycin									
Amikacin									
Imipenem									
Meropenem									
Colistin									

Send this form to (Name/Institute/Contact details):