New concept proposal

Microbiology Lab Concepts

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1 Rationale

The evaluation of the presence and amount of microorganisms including bacteria, virus, fungi, measured in biosamples taken from patients or other objects like catheters is an important task in clinical routine. Furthermore, antibiotic resistance information has to be determined. To identify microorganisms also microscopy observations can be important, hence the inclusion of concepts to report observations obtained by microscopy. Other important measurements like host-pathogen interactions or immune reactions will be addressed elsewhere. This document presents the modelling of concepts for representing these microbiology lab tests.

History
The concepts for microbiology were initially developed within the PSSS project by the Data Integration Team (DIT): Rita Achermann (USB), Pierre Chodanowski (CHUV), Adel Bensahla Talet (HUG), Barbara Jesacher (Insel), Jan Bartussek (USZ). Throughout the development process, DIT exchanged knowledge with the microbiology specialists at each hospital.

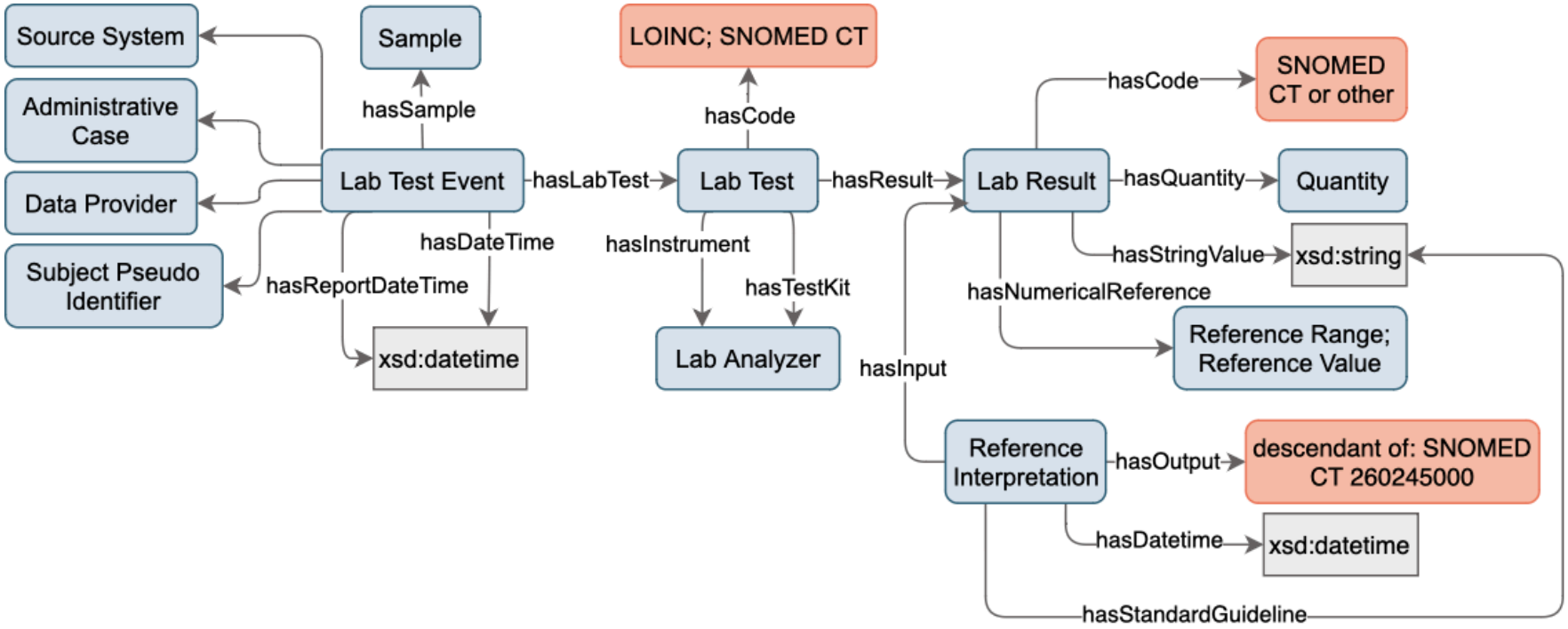
In a second phase, the PSSS team reviewed the developed microbiology PSSS concepts in 3 meetings in which microbiologists from all 5 university hospitals participated as well as Aitana Lebrand (SIB Lausanne) and Marcel Hanselmann (related to FMH Microbio). The focus of the review was to check whether all relevant clinical information could be represented by the concepts and the chosen terminology/value sets were suitable. Note that the concepts were not designed to cover all aspects needed for a particular research project in microbiology, but rather to cover clinical routine data. Within PSSS, a final written approval by each microbiologist and data scientist was not obtained as the PSSS project ended and the successor project was not yet started.
With the IICU project, the microbiology concepts have now been restructured and updated according to the new structure of the lab concepts defined in the SPHN Dataset (and approved by the Semantics WG). The rationale is therefore the same as in the lab concepts: the process describes the test event performed on a sample (or in the case of some microbiology tests, on an isolate) which can hold different lab tests being performed with given characteristics (substance tested in a susceptibility lab test, staining method applied on a microbiology microscopy lab test, etc), and each lab test holds the obtained results.

The primarily defined microbiology concepts were missing a connection between a sample and its possible isolates which are in turn being tested in lab tests. This is now possible to connect with the reuse of a concept defined for the omics data: the Sample Processing which takes as input a Sample and can give as output an Isolate.

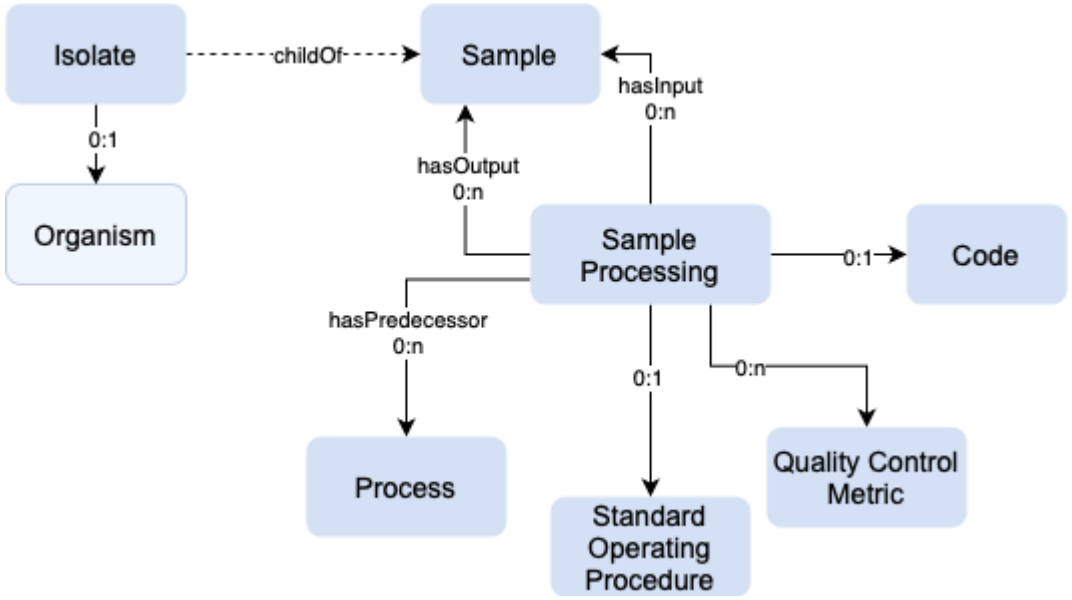
2 Comparison to other standards/data models

3 List of concepts and composedOfs

For information: Updated Lab concepts from SPHN



3.1 Isolate and Sample Processing



The isolate is needed to represent populations of organisms extracted from a sample.
Thus an isolate can have at most one organism detected. The concept isolate is in line with the developments done for omics data. The isolate is a child of the Sample concept and therefore inherits the Sample's composedOfs.

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composed Of
concept	Isolate	a specific individual microbe and its clone separated on a single occasion from a sample taken from a host or culture system	Isolate	a specific individual microbe and its clone separated on a single occasion from a sample taken from a host or culture system	Sample			SNOMED:119303007 | Microbial isolate specimen (specimen) |	
inherited	identifier	unique identifier identifying the concept	identifier	unique identifier identifying the isolate	string				0:n
inherited	material type code	coded information specifying the material type of the	material type code	coded information specifying the material type of the	Code	SNOMED CT	descendant of: 123038009		0:n

		concept		isolate			|Specimen (specimen)|		
inherited	body site	anatomical site or structure associated to the concept	body site	anatomical site or structure associated to the concept	Body Site				0:1
inherited	collection datetime	datetime of collection of the concept	collection datetime	datetime of collection of the isolate	temporal				1:1
inherited	fixation type	fixation or stabilization type	fixation type	fixation or stabilization type	qualitative				0:1
inherited	primary container	type of primary container of the concept	primary container	type of primary container of the isolate	qualitative				0:1
composedOf	organism	organism associated to the concept	organism	organism that was isolated	Organism				0:1

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Isolate	0:1	1:1	1:1	1:n

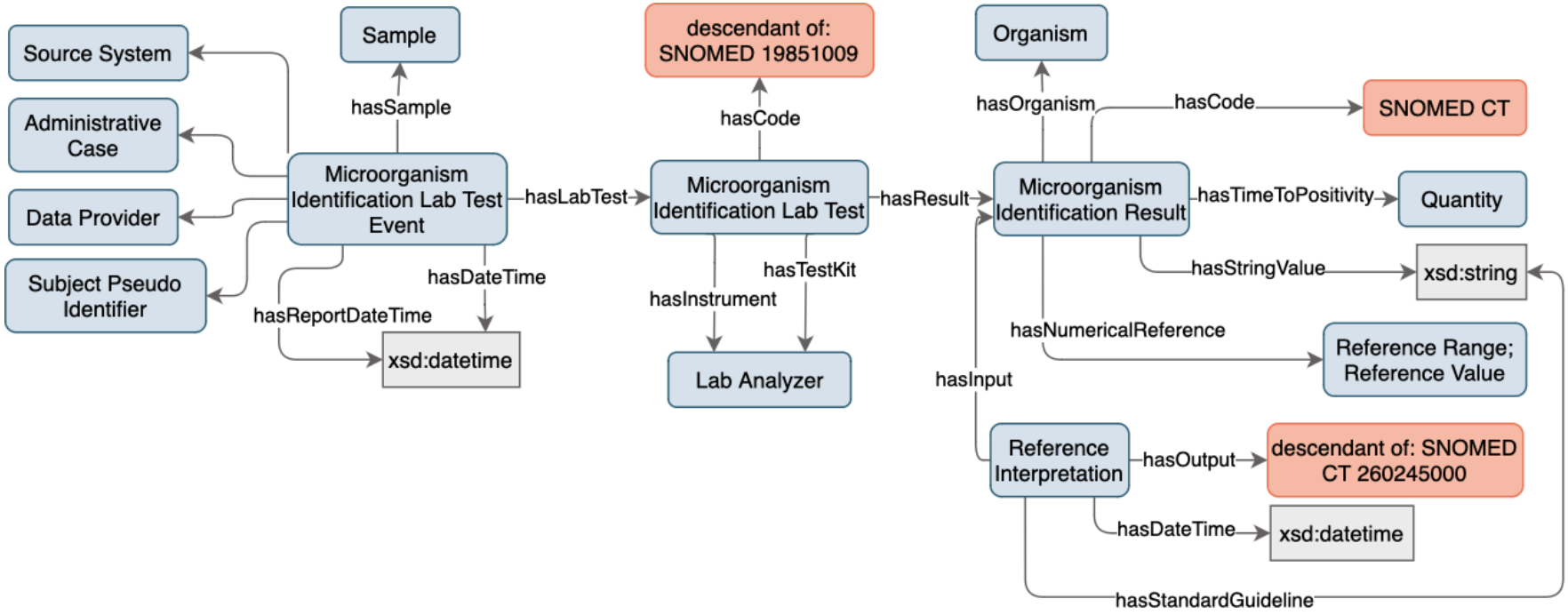
Sample processing is a concept to represent manipulations performed on a sample before it is analyzed. This is useful in microbiology to identify the process when a sample is cultured for generating isolates. This concept is in line with the developments done for omics data.

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composed Of
concept	Sample Processing	an experimental process that prepares a sample for a subsequent experimental process	Sample processing	an experimental process that prepares a sample for a subsequent experimental process	Experimental Process				
composedOf	code	coded information specifying the concept	code	coded information specifying the sample processing	Code				0:n
composedOf	input	the input sample	input	the input sample	Sample				0:n
composedOf	output	the output sample	output	the output sample	Sample				0:1
composedOf	quality control metric	quality control metric related to the output of the concept	quality control metric	quality control metric related to the output of the sample processing	Quality Control Metric				0:n
composedOf	predecessor	previous process that this process logically follows	predecessor	previous process that this sample processing logically follows	Process			RO:RO:0002087 | immediately preceded by |	0:n
composedOf	standard operating procedure	the Standard Operating Procedure that was followed for this process	standard operating procedure	the Standard Operating Procedure that was followed for this sample processing	Standard Operating Procedure				0:1

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Sample Processing	0:n	1:1	0:n	1:n

3.2 Microorganism Identification

The concepts related to microorganism identification aim to cover lab test events that aim to identify and characterise microorganisms present in a sample.



3.2.1 Microorganism Identification Lab Test Event

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composedOf
concept	**Microorganism Identification Lab Test Event**	occurrence in which one or multiple laboratory tests are performed on a sample at a given time for	**Microorganism Identification Lab Test Event**	occurrence in which one or multiple laboratory tests are performed on a sample at a	Lab Test Event				

		identifying microorganism(s)		given time for identifying microorganism(s)					
inherited	sample	sample associated to the concept	sample	sample tested during the microorganism identification lab test event	Sample				1:1
inherited	datetime	datetime of the concept	event datetime	datetime when the microorganism identification lab test event (analysis) was performed	temporal				0:1
inherited	report datetime	datetime the concept was reported	report datetime	datetime the microorganism identification lab test event was reported	temporal				0:1
inherited	lab test	lab test associated to the concept	microorganism identification lab test	microorganism identification lab test performed	Microorganism Identification Lab Test				1:n

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Microorganism Identification Lab Test Event	0:1	1:1	1:1	1:n

3.2.2 Microorganism Identification Lab Test

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composedOf
concept	**Microorganism Identification Lab Test**	specific lab test performed on a sample for identifying microorganism(s)	**Microorganism Identification Lab Test**	specific lab test performed on a sample for identifying microorganism(s)	Lab Test				

inherited	code	coded information specifying the concept	code	coded information specifying the microorganism identification lab test	Code	SNOMED CT	descendant of: 19851009 |Microbiology procedure (procedure)|		1:1
inherited	instrument	instrument used for the concept	instrument	instrument used to assess medical laboratory samples	Lab Analyzer				0:1
inherited	test kit	test kit used for the concept	test kit	test kit used to assess medical laboratory samples	Lab Analyzer				0:1
inherited	result	evaluation outcome associated to the concept	microorganism identification lab test result	result identifying a microorganism in a lab test	Microorganism Identification Result				1:n

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Microorganism Identification Lab Test	-	-	-	-

3.2.3 Microorganism Identification Result

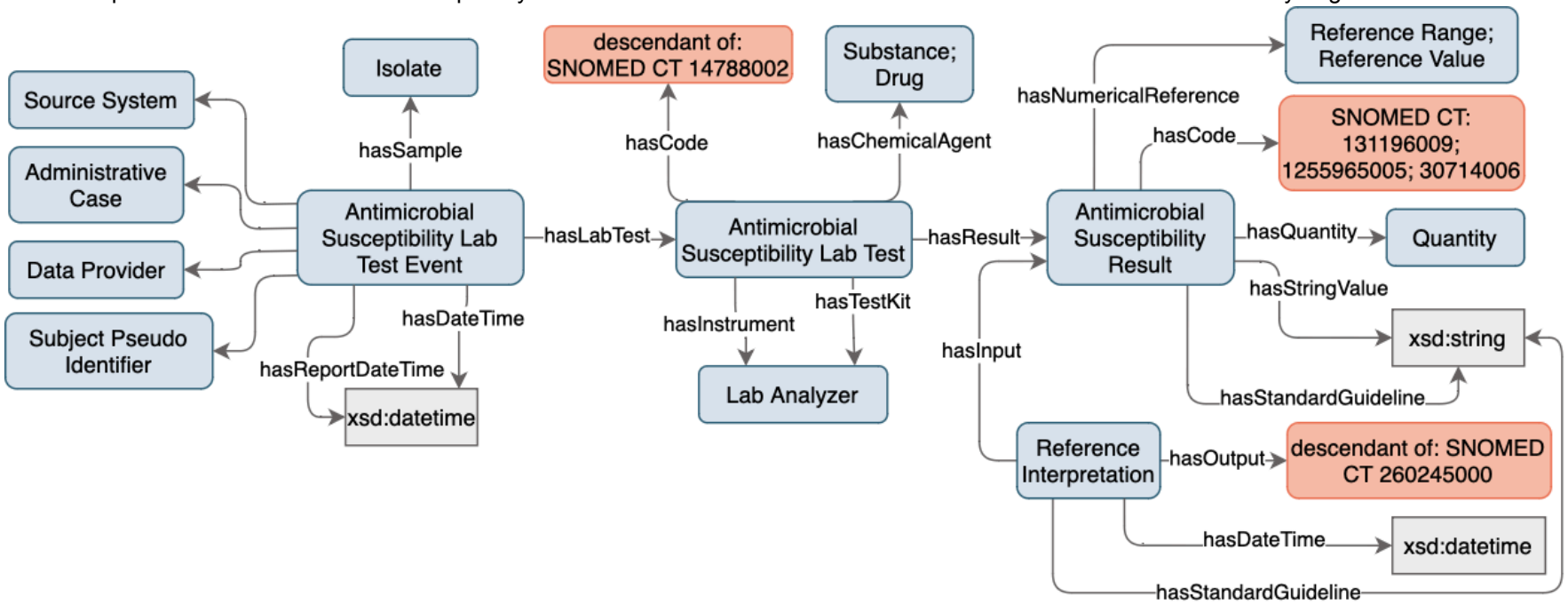
Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composedOf
concept	**Microorganism Identification Result**	result of the microorganism identification lab test	**Microorganism Identification Result**	result of the microorganism identification lab test	Result				

composedOf	code	coded information specifying the concept	qualitative result code	coded qualitative result of the microorganism identification test	Code	SNOMED CT	2667000 |Absent (qualifier value)|; 52101004 |Present (qualifier value)|; 373068000 |Undetermined (qualifier value)|		0:1
composedOf	time to positivity	time to positivity associated to the concept	time to positivity	span of time from the beginning of culture incubation to the detection of microorganism growth (e.g. blood culture)	Quantity				0:1
composedOf	string value	textual representation	string value result	textual representation specifying the result	string				0:1
composedOf	numerical reference	numerical reference associated to the concept	numerical reference	reference range or reference value associated to the microorganism identification result	Reference Range; Reference Value				0:1
composedOf	organism	organism associated to the concept	microorganism	microorganism identified in the microorganism identification lab test	Organism				0:1

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Microorganism Identification Result	-	-	-	-

3.3 Antimicrobial Susceptibility

The concepts related to antimicrobial susceptibility covers lab test events that aim to test an isolate to examine its sensitivity to given substances.



3.3.1 Antimicrobial Susceptibility Lab Test Event

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composedOf
concept	**Antimicrobial Susceptibility Lab Test Event**	occurrence in which one or multiple laboratory tests are performed on an isolate at a given time for determining antimicrobial susceptibility	**Antimicrobial Susceptibility Lab Test Event**	occurrence in which one or multiple laboratory tests are performed on an isolate at a given time for determining antimicrobial susceptibility	Lab Test Event				

inherited	sample	sample associated to the concept	antimicrobial susceptibility lab test isolate	isolate on which the antimicrobial susceptibility lab test was performed	Isolate				1:1
inherited	datetime	datetime of the concept	event datetime	datetime when the antimicrobial susceptibility lab test event (analysis) was performed	temporal				0:1
inherited	report datetime	datetime the concept was reported	report datetime	datetime the antimicrobial susceptibility lab test event was reported	temporal				0:1
inherited	lab test	lab test associated to the concept	antimicrobial susceptibility lab test	lab test used to determine antimicrobial susceptibility	Antimicrobial Susceptibility Lab Test				1:n

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Antimicrobial Susceptibility Lab Test Event	0:1	1:1	1:1	1:n

3.3.2 Antimicrobial Susceptibility Lab Test

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composedOf
concept	**Antimicrobial Susceptibility Lab Test**	specific lab test performed on an isolate against a chemical agent for determining antimicrobial susceptibility	**Antimicrobial Susceptibility Lab Test**	specific lab test performed on an isolate against a chemical agent for determining antimicrobial susceptibility	Lab Test				

inherited	code	coded information specifying the concept	code	coded information specifying the antimicrobial susceptibility lab test performed	Code	SNOMED CT	descendant of: 14788002 |Antimicrobial susceptibility test (procedure)|		1:1
inherited	instrument	instrument used for the concept	instrument	instrument used to assess medical laboratory samples	Lab Analyzer				0:1
inherited	test kit	test kit used for the concept	test kit	test kit used to assess medical laboratory samples	Lab Analyzer				0:1
inherited	result	evaluation outcome associated to the concept	antimicrobial susceptibility lab test result	antimicrobial susceptibility analysis result for a specific isolate analyzed	Antimicrobial Susceptibility Result				1:n
composedOf	chemical agent	chemical agent associated to the concept	tested chemical agent	substance or drug against which the antimicrobial susceptibility test was done	Substance; Drug				1:1

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Antimicrobial Susceptibility Lab Test	-	-	-	-

3.3.3 Antimicrobial Susceptibility Result

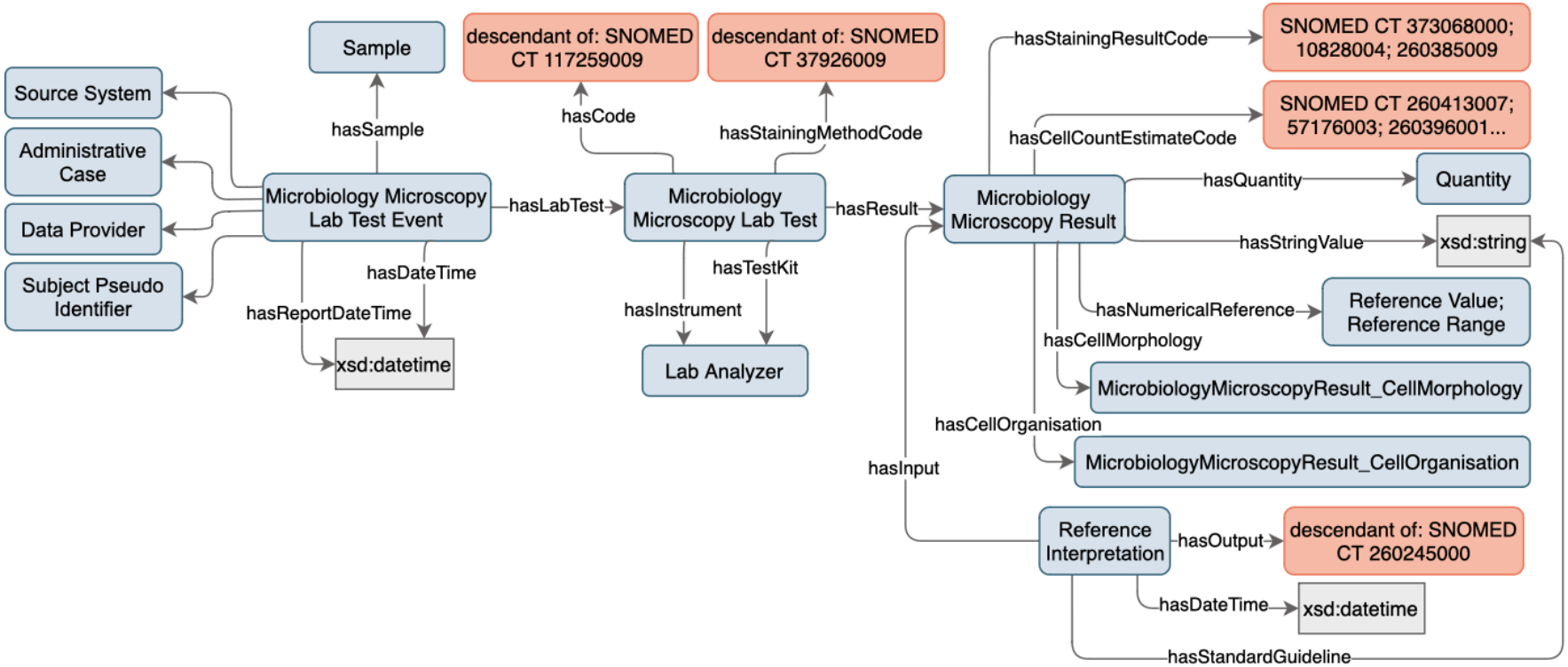
Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composedOf
concept	**Antimicrobial Susceptibility Result**	result of a antimicrobial susceptibility lab analysis	**Antimicrobial Susceptibility Result**	antimicrobial susceptibility analysis results for a specific isolate analyzed	Result				
composedOf	quantity	an amount or a number of the concept	quantitative result	value and unit of the quantitative result	Quantity				0:1

composedOf	code	coded information specifying the concept	qualitative result code	coded qualitative result of the antimicrobial susceptibility test	Code	SNOMED CT	131196009 |Susceptible (qualifier value)|; 1255965005 | Susceptible with increased exposure (qualifier value)|; 30714006 |Resistant (qualifier value)|		0:1
composedOf	string value	textual representation	string value result	textual representation specifying the result	string				0:1
composedOf	numerical reference	numerical reference associated to the concept	numerical reference	reference range or reference value associated to the antimicrobial susceptibility result	Reference Range; Reference Value				0:1
composedOf	standard guideline	standard guideline associated to the concept	standard guideline	guideline used for interpretation of the susceptibility result: publication reference or link to a document	string				0:1

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Antimicrobial Susceptibility Result	-	-	-	-

3.4 Microbiology Microscopy

The concepts related to Microbiology Microscopy aim to cover microscopy test events leading to the observation of cells and provide a description of these cells.



3.4.1 Microbiology Microscopy Lab Test Event

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composedOf
concept	**Microbiology Microscopy Lab Test Event**	occurrence in which one or multiple microbiology microscopy laboratory	**Microbiology Microscopy Lab Test Event**	occurrence in which one or multiple microbiology microscopy laboratory	Lab Test Event				

		tests are performed on a sample at a given time		tests are performed on a sample at a given time					
inherited	sample	sample associated to the concept	tested sample	sample tested in the microbiology microscopy lab test event	Sample				1:1
inherited	lab test	test associated with the concept	microbiology microscopy lab test	microbiology microscopy lab test performed	Microbiology Microscopy Lab Test				1:n
inherited	datetime	datetime of the concept	event datetime	datetime when the lab test event (analysis) was performed	temporal				0:1
inherited	report datetime	datetime the concept was reported	report datetime	datetime the report document has been generated	temporal				0:1

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Microbiology Microscopy Lab Test Event	0:1	1:1	1:1	1:n

3.4.2 Microbiology Microscopy Lab Test

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composedOf
concept	**Microbiology Microscopy Lab Test**	specific microbiology microscopy lab test performed on a sample	**Microbiology Microscopy Lab Test**	specific microbiology microscopy lab test performed on a sample	LabTest				

inherited	code	coded information specifying the concept	microbiology microscopy lab test code	coded information specifying the microbiology microscopy lab test	Code	SNOMED CT	descendant of: 117259009 |Microscopy (procedure)|		1:1
inherited	result	evaluation outcome associated to the concept	microbiology microscopy lab test result	result of the microbiology microscopy lab test	Microbiology Microscopy Result				1:n
inherited	instrument	instrument used for the concept	instrument	instrument used to assess medical laboratory samples	Lab Analyzer				0:1
inherited	test kit	test kit used for the concept	test kit	test kit used to assess medical laboratory samples	Lab Analyzer				0:1
composedOf	staining method code	coded information specifying the staining method associated to the concept	microscopy staining method code	code of the microscopy staining method used in the microbiology microscopy lab test	Code	SNOMED CT	descendant of: 37926009 |Microbial stain method (procedure)|		0:1

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Microbiology Microscopy Lab Test	-	-	-	-

3.4.3 Microbiology Microscopy Result

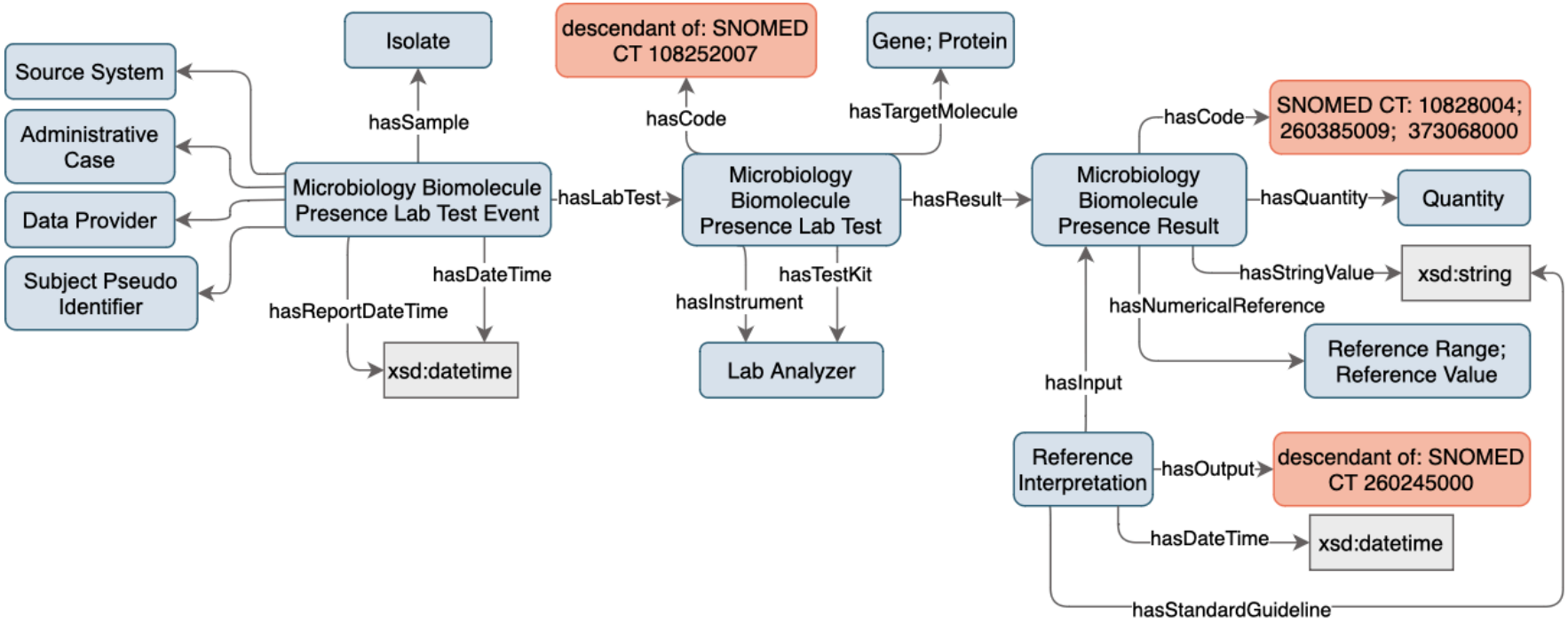
Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composed Of

concept	**Microbiology Microscopy Result**	microscopy analysis results for a specific studied biosample in microbiology	**Microbiology Microscopy Result**	microscopy analysis results for a specific studied biosample in microbiology	Result				
composedOf	quantity	an amount or a number of the concept	quantitative result	value and unit of the quantitative result	Quantity				0:1
composedOf	staining result code	coded information specifying the staining result associated to the concept	qualitative staining result code	code of a staining result observed in the microbiology microscopy lab test	Code	SNOMED CT	373068000 |Undetermined (qualifier value)|; 10828004 |Positive (qualifier value)|; 260385009 |Negative (qualifier value|		0:1
composedOf	string value	textual representation	string value result	textual representation specifying the result	string				0:1
composedOf	numerical reference	numerical reference associated to the concept	numerical reference	reference range or reference value associated to the microbiology microscopy result	Reference Range; Reference Value				0:1
composedOf	cell count estimate code	code of the estimated cell count associated to the concept	cell count estimate code	code of the estimated cell count from the microbiology microscopy lab test	Code	SNOMED CT	260413007 |None (qualifier value)|; 57176003 |Few (qualifier value)|; 260396001 |Numerous (qualifier value)|; 46998006 |Massive (qualifier value)|		0:1
composedOf	cell morphology	cell morphology associated to the concept	cell morphology	shape observed of the cell as a result of the microbiology microscopy lab test	qualitative		Round; Rod-Shaped; Curved-Rod-Shaped; Spiral; Filamentous; Ovoid; Elongated; Other		0:1
composedOf	cell organization	cell organization associated to the concept	cellular organization	observed cellular organization in the microbiology microscopy lab test	qualitative		Unicellular; Multicellular; Entire Cell		0:1

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Microbiology Microscopy Result	-	-	-	-

3.5 Microbiology Biomolecule Presence

The concepts related to Microbiology Biomolecule Presence aim to cover lab test events that verifies the presence of a particular molecule (gene or protein) in an isolate.



3.5.1 Microbiology Biomolecule Presence Lab Test Event

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composedOf
concept	**Microbiology Biomolecule Presence Lab Test Event**	occurrence in which one or multiple laboratory tests are performed on an isolate at a given time to detect the	**Microbiology Biomolecule Presence Lab Test Event**	occurrence in which one or multiple laboratory tests are performed on an isolate at a given time to detect the presence of a biomolecule	Lab Test Event				

		presence of a biomolecule							
inherited	sample	sample associated to the concept	sample isolate	sample isolate tested during the microbiology biomolecule presence lab test event	Isolate				1:1
inherited	datetime	datetime of the concept	event datetime	datetime when the lab test event (analysis) was performed	temporal				0:1
inherited	report datetime	datetime the concept was reported	report datetime	datetime the report document has been generated	temporal				0:1
inherited	lab test	lab test associated to the concept	microorganism identification lab test	microbiology biomolecule presence lab test performed	Microbiology Biomolecule Presence Lab Test				1:n

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Microbiology Biomolecule Presence Lab Test Event	0:1	1:1	1:1	1:n

3.5.2 Microbiology Biomolecule Presence Lab Test

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composedOf
concept	**Microbiology Biomolecule Presence Lab Test**	specific lab test performed on an isolate for detecting	**Microbiology Biomolecule Presence Lab Test**	specific lab test performed on an isolate for detecting the presence of a target biomolecule	Lab Test				

		the presence of a target biomolecule							
inherited	code	coded information specifying the concept	code	coded information specifying the microbiology biomolecule presence lab test performed	Code	SNOMED CT	descendant of 108252007 |Laboratory procedure (procedure)|		1:1
inherited	instrument	instrument used for the concept	instrument	instrument used to assess medical laboratory samples	Lab Analyzer				0:1
inherited	test kit	test kit used for the concept	test kit	test kit used to assess medical laboratory samples	Lab Analyzer				0:1
inherited	result	evaluation outcome associated to the concept	microbiology biomolecule presence lab test result	result of microbiology biomolecule presence test for a specific isolate analyzed	Microbiology Biomolecule Presence Result				1:n
composedOf	target molecule	target molecule associated to the concept	targeted biomolecule	biomolecule against which the microbiology biomolecule presence lab test was done	Gene; Protein				1:1

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Microbiology Biomolecule Presence Lab Test	-	-	-	-

3.5.3 Microbiology Biomolecule Presence Result

Concept or concept compositions or inherited	General concept name	General description	Contextualized concept name	Contextualized description	Type	Standard	Value set or subset	Meaning binding	Cardinality for composedOf
concept	**Microbiology Biomolecule Presence Result**	result of microbiology biomolecule presence test for a specific isolate analyzed	**Microbiology Biomolecule Presence Result**	result of microbiology biomolecule presence test for a specific isolate analyzed	Result				
composedOf	quantity	an amount or a number of the concept	quantitative result	value and unit of the quantitative result	Quantity				0:1
composedOf	code	coded information specifying the concept	qualitative result code	code of a result from the microbiology biomolecule presence lab test	Code	SNOMED CT	10828004 |Positive (qualifier value)|; 260385009 |Negative (qualifier value|; 373068000 |Undetermined (qualifier value)|		0:1
composedOf	string value	textual representation	string value result	textual representation specifying the result	string				0:1
composedOf	numerical reference	numerical reference associated to the concept	numerical reference	reference range or reference value associated to the microbiology biomolecule presence result	Reference Range; Reference Value				0:1

General concept name	Cardinality for concept to Administrative Case	Cardinality for concept to Data Provider	Cardinality for concept to Subject Pseudo Identifier	Cardinality for concept to Source System
Microbiology Biomolecule Presence Result	-	-	-	-

3.6 Interpretation of results

Sometimes, the result produced from an antimicrobial susceptibility lab test has inferred knowledge that is built from a standard guideline that interprets in some way the results. To encode interpretation, the new 2024.1 SPHN Interpretation and Reference Interpretation concepts can be used.

4 Impact on the SPHN Dataset

None, this would follow the pattern defined in the lab concepts and would be classified as a child of the related concepts.

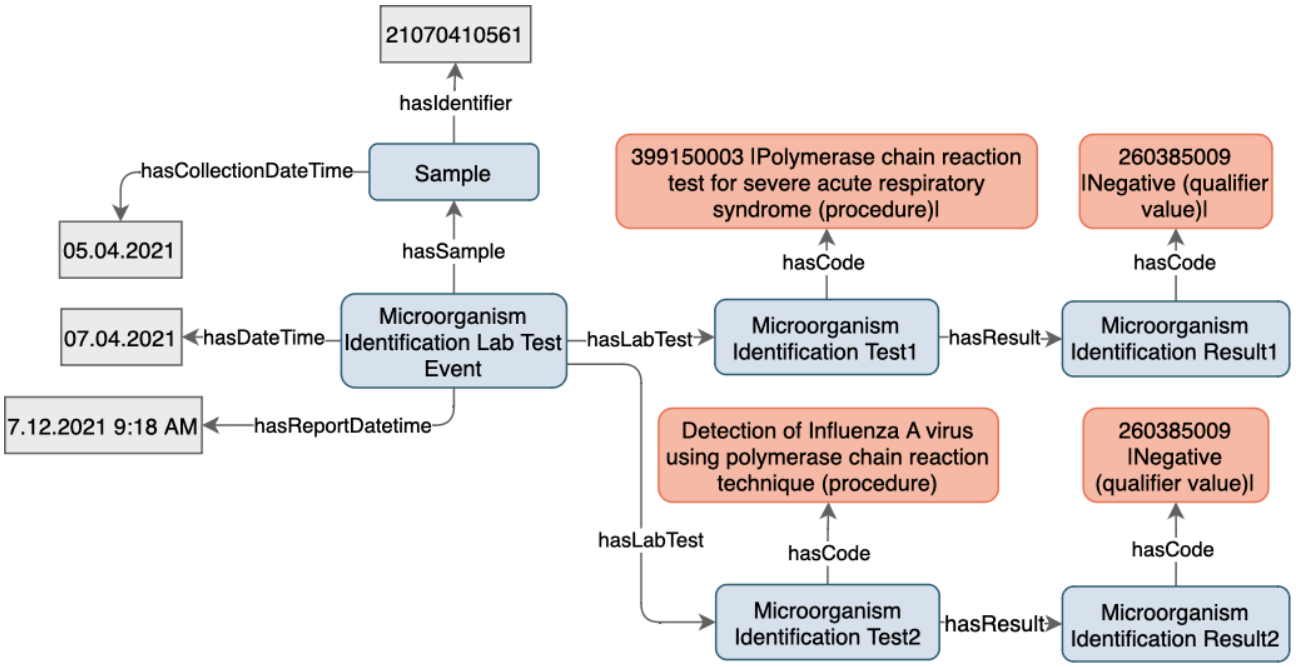
5 Discussion

The value 131196009 |Susceptible (qualifier value)| in the value set of the code-property of the Antimicrobial Susceptibility Result shall be used with the meaning "Susceptible, standard dosing regimen" in line with the EUCAST Breakpoint tables for interpretation of MICs and zone diameters Version 13.1 (http://www.eucast.org).

6 Example

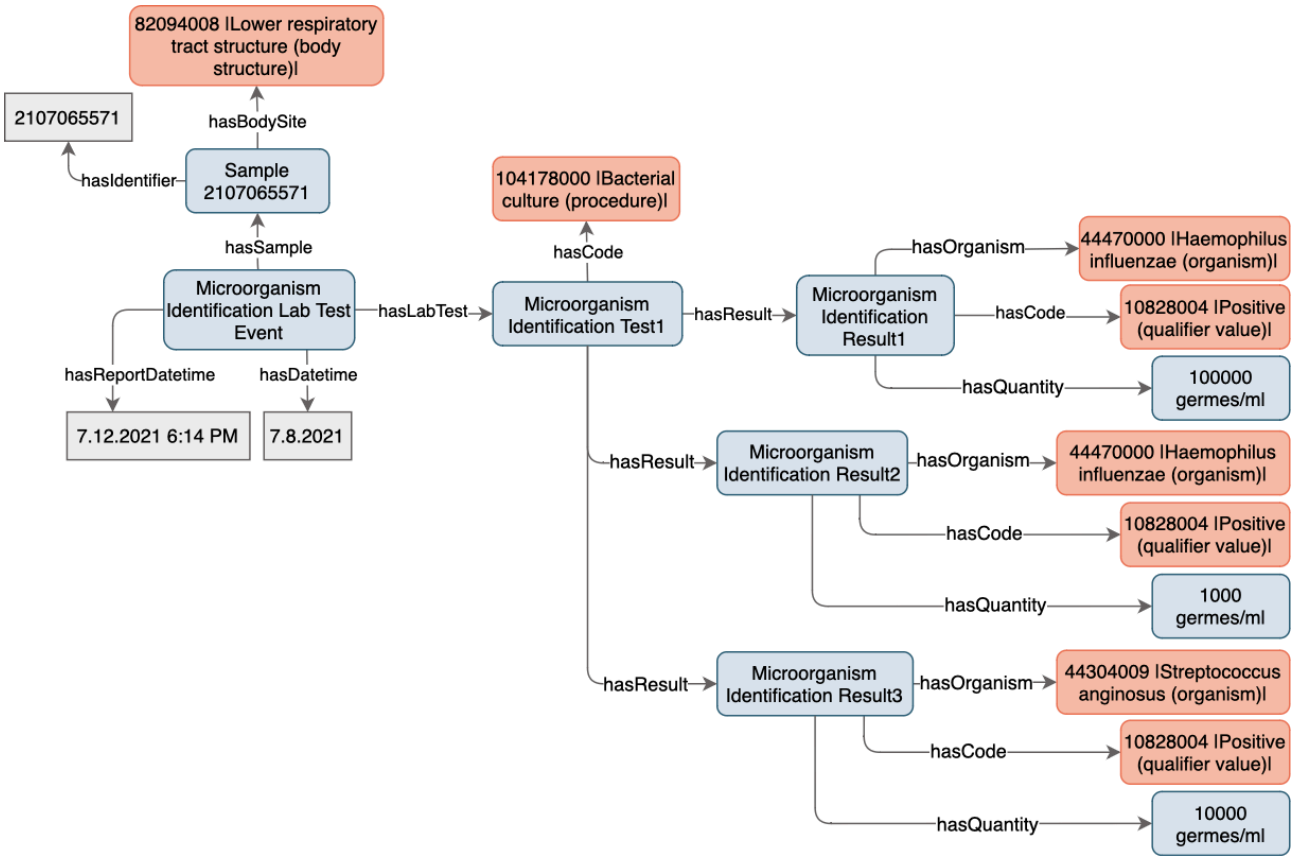
6.1 Example of Microorganism Identification Lab Test Event

6.1.1 One sample tested in two different tests



Microorganism Identification Lab Test Event
- report datetime: 07.12.2021 9:18
- datetime: 07.04.2021
- sample:
  - identifier: 21070410561
  - fixation type: -
  - material type code: -
  - collection datetime: 05.12.2021
- microorganism identification test 1:
  - code: 399150003 |Polymerase chain reaction test for severe acute respiratory syndrome (procedure)|
  - result:
    - code: 260385009 |Negative (qualifier value)|
    - quantity: -
    - string value: -
- microorganism identification test 2:
  - code: 772835009 |Detection of Influenza A virus using polymerase chain reaction technique (procedure)|
  - result:
    - code: 260385009 |Negative (qualifier value)|
    - quantity: -
    - string value: -

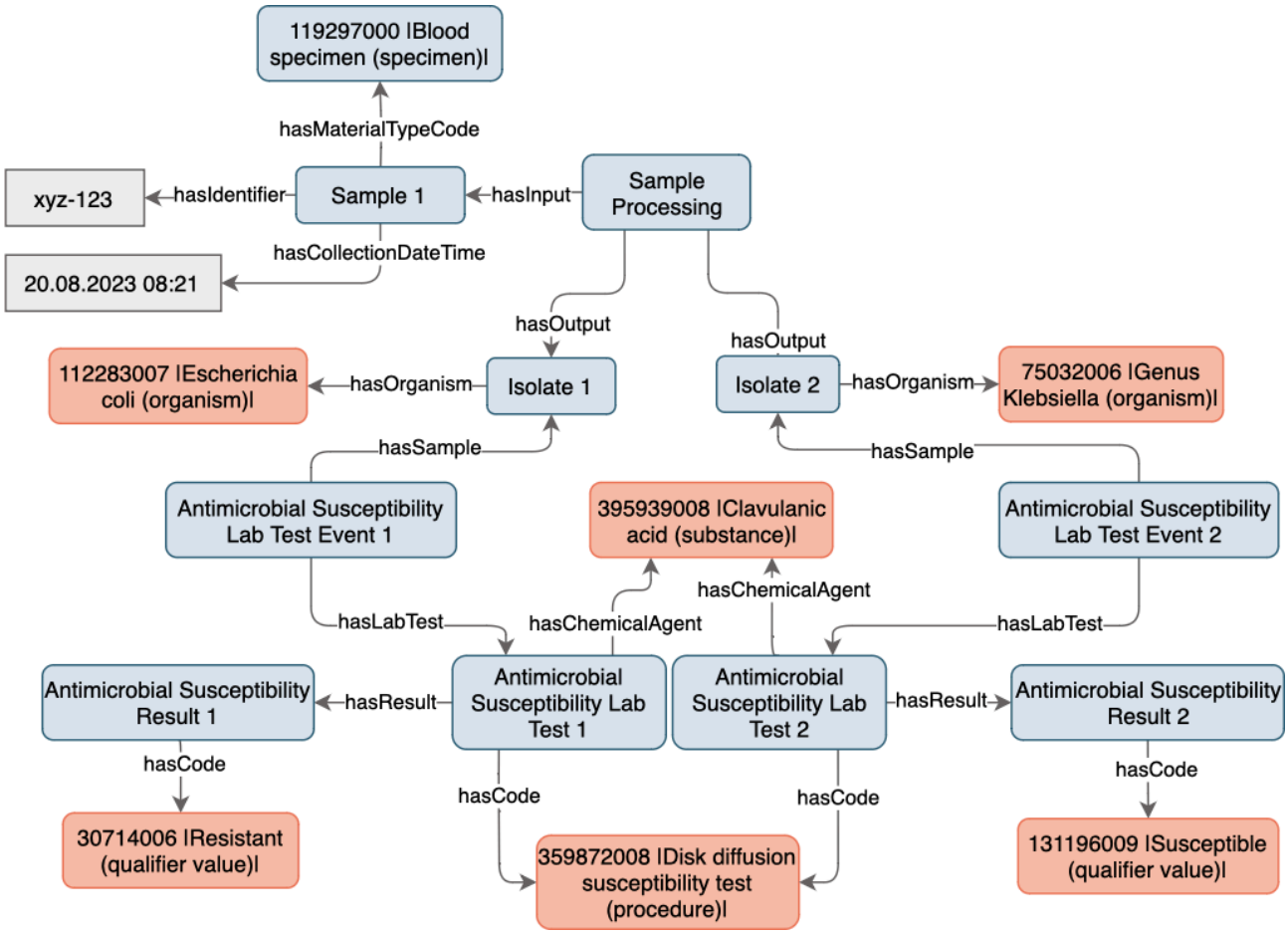
6.1.2 One sample tested in a single test leading to many results



Microorganism Identification Lab Test Event
- report datetime: 07.12.2021 18:14
- datetime: 07.08.2021
- sample:
  - identifier: 2107065571
  - body site -> code: 82094008 |lower respiratory tract structure (body structure)|
- microorganism identification test 1:
  - code: 104178000 |Bacterial culture (procedure)|
  - microorganism identification result 1:
    - code: 10828004 |Positive (qualifier value)|
    - quantity:
      - value: 100000
      - unit -> code: {#}/ml
    - string value: -
    - organism: 44470000 |Haemophilus influenzae (organism)|
  - microorganism identification result 2:
    - code: 10828004 |Positive (qualifier value)|
    - quantity:
      - value: 1000
      - unit -> code: {#}/ml
    - organism: 44470000 |Haemophilus influenzae (organism)|
  - microorganism identification result 3:
    - code: 10828004 |Positive (qualifier value)|
    - quantity:
      - value: 10000
      - unit -> code: {#}/ml
    - string value: -

organism: 44304009 |Streptococcus anginosus (organism)|

6.2 Example of Antimicrobial Susceptibility Test Events on two isolates extracted from a sample



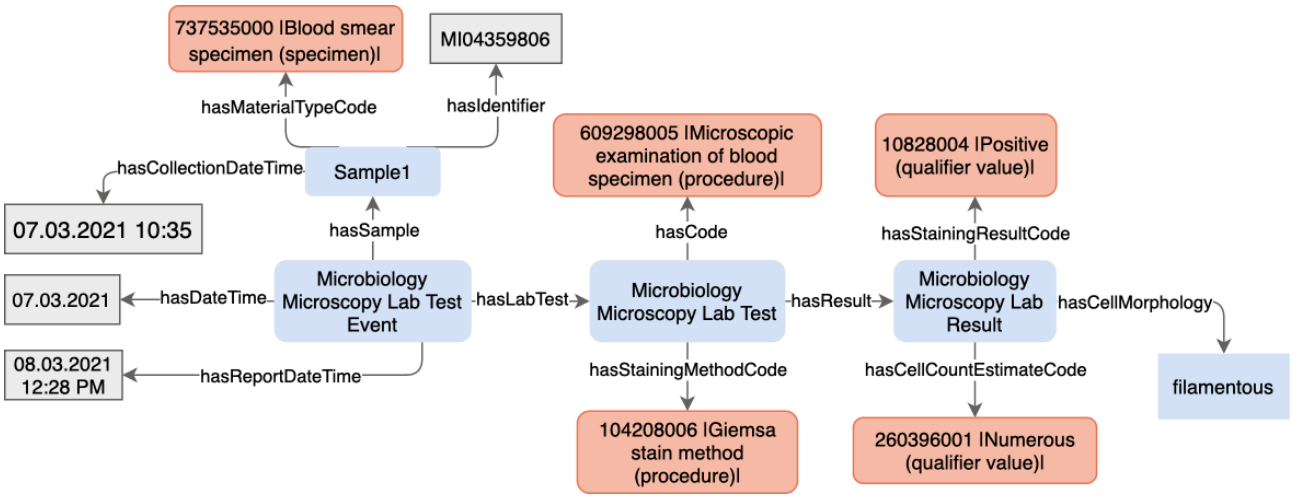
The Sample Processing concept enables the representation of the process where Isolates are being extracted from a Sample (not fully depicted in the text example below).
Note: for representing the 'identification' process of these two isolates, a Microorganism Identification Lab Test Event must be instantiated (see example 6.1.2).

Antimicrobial Susceptibility Lab Test Event 1
- sample (Isolate):
  - identifier: Isolate_1
  - organism: 112283007 |Escherichia coli|
  - collection datetime: 20.08.2023 08:21
- datetime: -
- report datetime: -
- lab test (Antimicrobial Susceptibility Lab Test 1):
  - code: 359872008 |Disk diffusion susceptibility test (procedure)|
  - instrument: -
  - test kit: -
  - chemical agent (Substance) -> code: 395939008 |Clavulanic acid (substance)|
  - result (Antimicrobial Susceptibility Result):
    - code: 30714006 |Resistant (qualifier value)|

quantity: -
string value: -
numerical reference: -
standard guideline: -

Antimicrobial Susceptibility Lab Test Event 2
sample (Isolate):
identifier: Isolate_2
organism: 75032006 |Genus Klebsiella (organism)|
datetime: -
report datetime: -
lab test (Antimicrobial Susceptibility Lab Test 2):
code: 359872008 |Disk diffusion susceptibility test (procedure)|
instrument: -
test kit: -
chemical agent (Substance) -> code: 395939008 |Clavulanic acid (substance)|
result (Antimicrobial Susceptibility Result):
code: 131196009 |Susceptible (qualifier value)|
quantity: -
string value: -
numerical reference: -
standard guideline: -

6.3 Example of a Microbiology Microscopy Lab Test Event



Microbiology Microscopy Lab Test Event
sample:
material type code: 737535000 |Blood smear specimen (specimen)|
identifier: MI04359806
collection datetime: 07.03.2021 10:35
datetime: 07.03.2021
report datetime: 08.03.2021 12:28
lab test (Microbiology Microscopy Lab Test):
code: 609298005 |Microscopic examination of blood specimen (procedure)|
staining method code: 104208006 |Giemsa stain method (procedure)|
result (Microbiology Microscopy Lab Result):
staining result code: 10828004 |Positive (qualifier value)|
quantity: -
string value: -

numerical reference: -
cell count estimate code: 260396001 |Numerous (qualifier value)|
cell morphology: filamentous
cell organization: -
instrument: -
test kit: -