Using Microbiology Data in CDW

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Objectives

1. To provide an overview of VA CDW Lab Microbiology 1.0 data
2. To provide examples of research uses of Lab Microbiology 1.0 data

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Acknowledgments

- Lishan Cao, Hines VA
- Margaret Gonsoulin, VIREC
- Makoto Jones, Salt Lake City VA
- Christopher Nielson, Reno VA
- Richard Pham, BISL/CDW
- Linda Poggensee, Hines VA
- Swetha Ramanathan, Hines VA
- Marin Schweizer, Iowa City VA
- Bridget Smith, Hines VA
- Kevin Stroupe, Hines VA

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Agenda for Presentation

- Why researchers would want to use these data
- Where the data is and an overview of what it includes
- Data structure and linking of tables
- Information on individual tables
- Two examples
- Strengths and Limitations
- Additional Resources

Poll #1: About you

- What is your role in VA research?
  - Research Investigator/PI
  - Data Manager/Analyst
  - Project Manager/Coordinator/Assistant
  - VA Program Office or Operations Staff
  - Other (please specify)

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Poll #2: Your micro experience

- What is your level of experience with CDW Lab Microbiology 1.0 data?
  - 1-Not worked with it at all
  - 2
  - 3
  - 4
  - 5-Very experienced with CDW Lab Microbiology 1.0

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Why should we be interested in learning about Lab Microbiology 1.0?

- First available national data set on select microbiology data (since Summer/Fall 2012)
  - Accomplishment because of the hierarchical and semi-structured nature of microbiology reports
- Opportunity for health services and outcomes research and clinical epidemiology in infectious disease
  - Risk factors for select bacterial infections/colonization or drug resistance
  - Assess treatment and management of bacterial infections/drug resistance
  - Outcomes of treatment or care and costs for those with bacterial infections/drug resistance
- Program Office/Operations or Clinical Services may want to use it for:
  - Surveillance of select bacterial infections/colonization or drug resistance
  - Building automated antibiograms
  - Assessing impact of national infectious disease initiatives

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Where is Lab Microbiology 1.0 located?

- CDW = Corporate Data Warehouse and VINCI
  - Data is stored in a relational format where data has been separated into multiple tables
  - Multiple domains (ie. Consult, Lab Chem)
  - A domain is a group of tables based on a specific subject matter
- Lab Microbiology 1.0
  - A production domain (processed) of CDW data
  - Access through VINCI

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What does Lab Microbiology 1.0 include?

- Contains individual-level data from VISTA microbiology package on the test and result
- Data from 10/1/1999 - present is available and updated regularly
- Bacteriology specimens only
  - Variability by facility in where different types of microbiologic data are stored, therefore some bacterial organisms may not be included in Lab Microbiology 1.0
  - Examples of tests that may be stored in different places (ie. PCR tests, antibody tests)
  - Examples of organisms that may be found elsewhere (ie. *Clostridium difficile*, Methicillin Resistant *Staphylococcus Aureus* (MRSA) identified by nasal swabs via PCR)

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What does Lab Microbiology 1.0 include?

- Variables of interest include free-text fields (e.g. ‘Organism’ or ‘CollectionSample’)
- Comprised of 2 fact tables and 7 dimension (dim) tables

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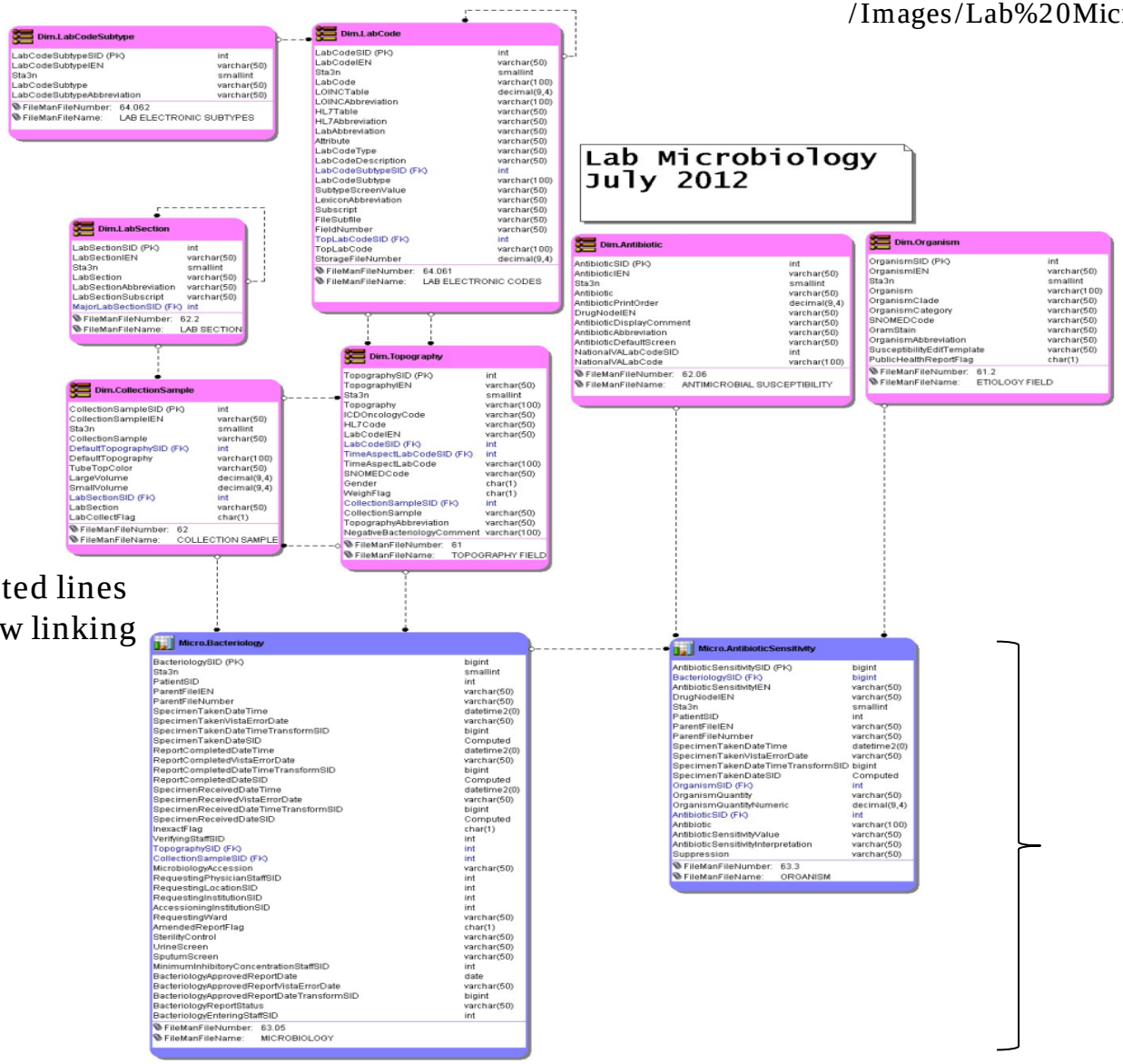
Lab Microbiology 1.0 Schema

https://vaww.dwh.cdw.portal.va.gov/metadata/Reports/Images/Lab%20Microbiology_99.jpg



DIM TABLES
"Supporting" tables

Dotted lines show linking

FACT TABLES
"Parent" tables

Lab Micro 1.0 Fact Tables

- There are 2 fact tables in Lab Microbiology
  - Bacteriology and AntibioticSensitivity
- Are large tables that hold test, patient, and staff identifiers
- As they contain sensitive information (e.g. 'PatientSID'), they can only be created with a VINCI request
- Prefix for tables is Micro, e.g. Micro.Bacteriology

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Lab Micro 1.0 Dimension Tables

- There are 7 dimension (dim) tables in Lab Microbiology
  - Organism, Antibiotic, Topography, CollectionSample, LabCode, LabSection, LabCodeSubtype
- Dimension tables, or dim tables, are supporting tables
- Can be viewed without a cohort, because they do not contain any sensitive information (e.g. 'PatientSID')
  - Can be viewed in VINCI in the folder named CDWWork
- Prefix for tables is Dim, e.g. Dim.Organism

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Micro.Bacteriology

- Contains data on all the specimens collected that are located in the Microbiology subsection of VISTA
  - Bacteriology only
- Specimen date and time information (e.g. collected, received, reported), accession, station
- Patient and staff unique identifiers (e.g. 'PatientSID')
- Additional variables include foreign keys (FK) that link to associated dim tables (or views)
- 'BacteriologySID' is the primary key (PK)

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Dim Tables for Micro.Bacteriology

- 5 dim tables: Topography, CollectionSample, LabCode, LabSection, LabCodeSubtype
- Provides supporting information for specimens in Micro.Bacteriology
- Topography and CollectionSample can be used to identify the location of an infection or the body site from where the specimen was taken
- The variable called 'NegativeBacteriologyComment' in Topography may provide information on negative cultures
- LabSection describes the laboratory area (i.e. blood bank)
- LabCode and LabCodeSubtype provide codes for electronic messaging (ie. LOINC, HL7)

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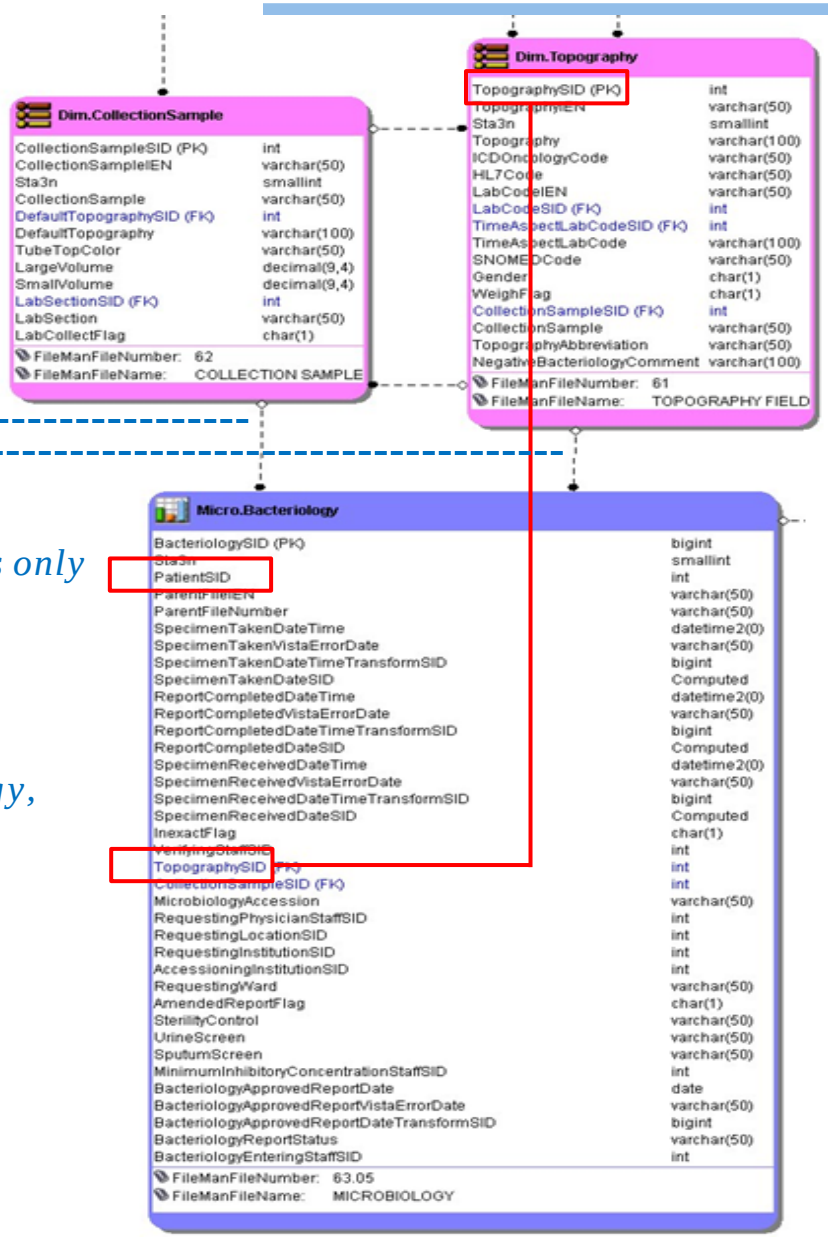
Linking between tables



Dotted lines indicate that two tables can be linked

Sensitive information is only found in Fact Tables

To link Dim.Topography to Micro.Bacteriology, match the PK of Dim. Topography (TopographySID) to the corresponding FK of Micro. Bacteriology (TopographySID)

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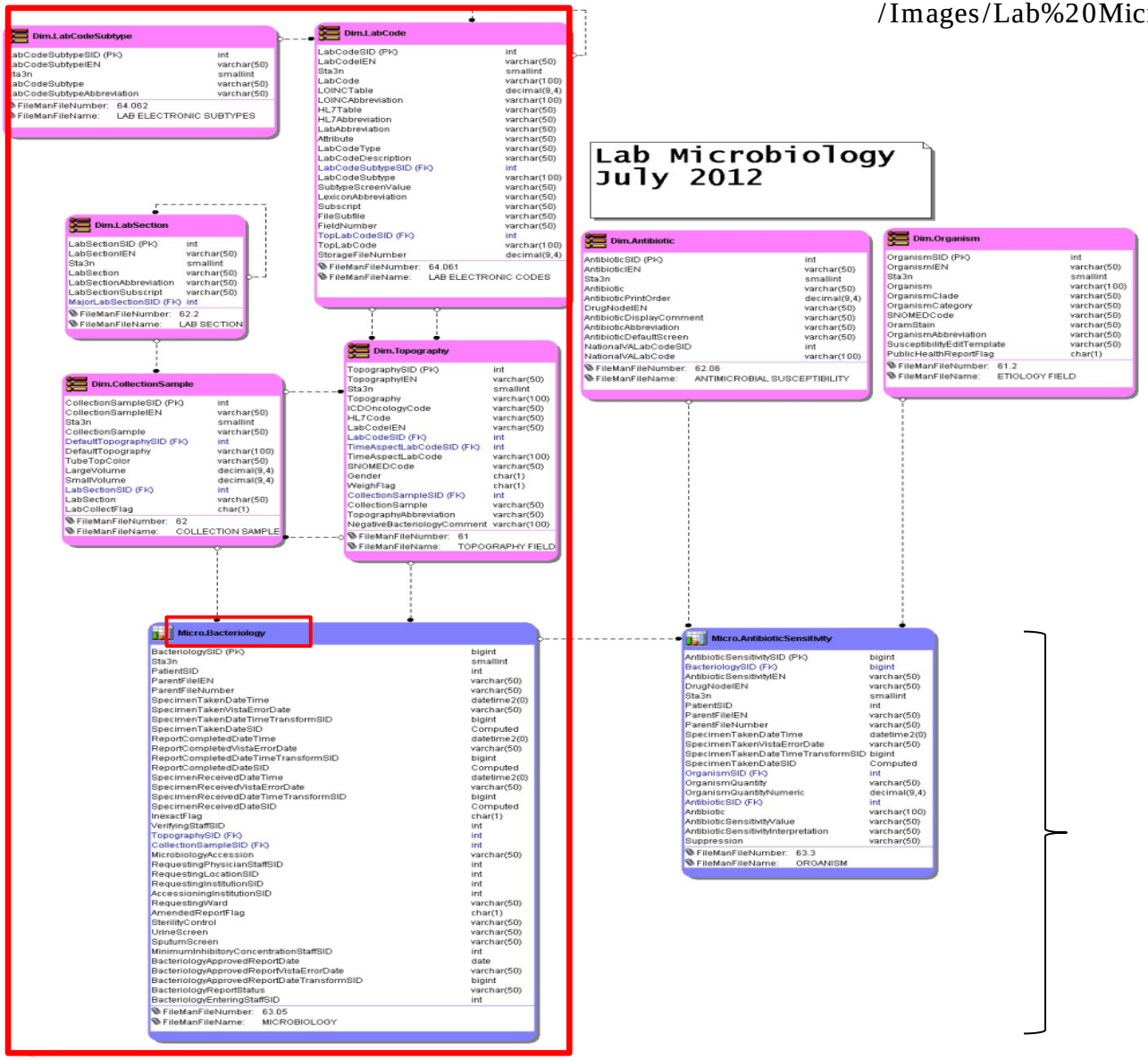
Lab Microbiology 1.0 Schema

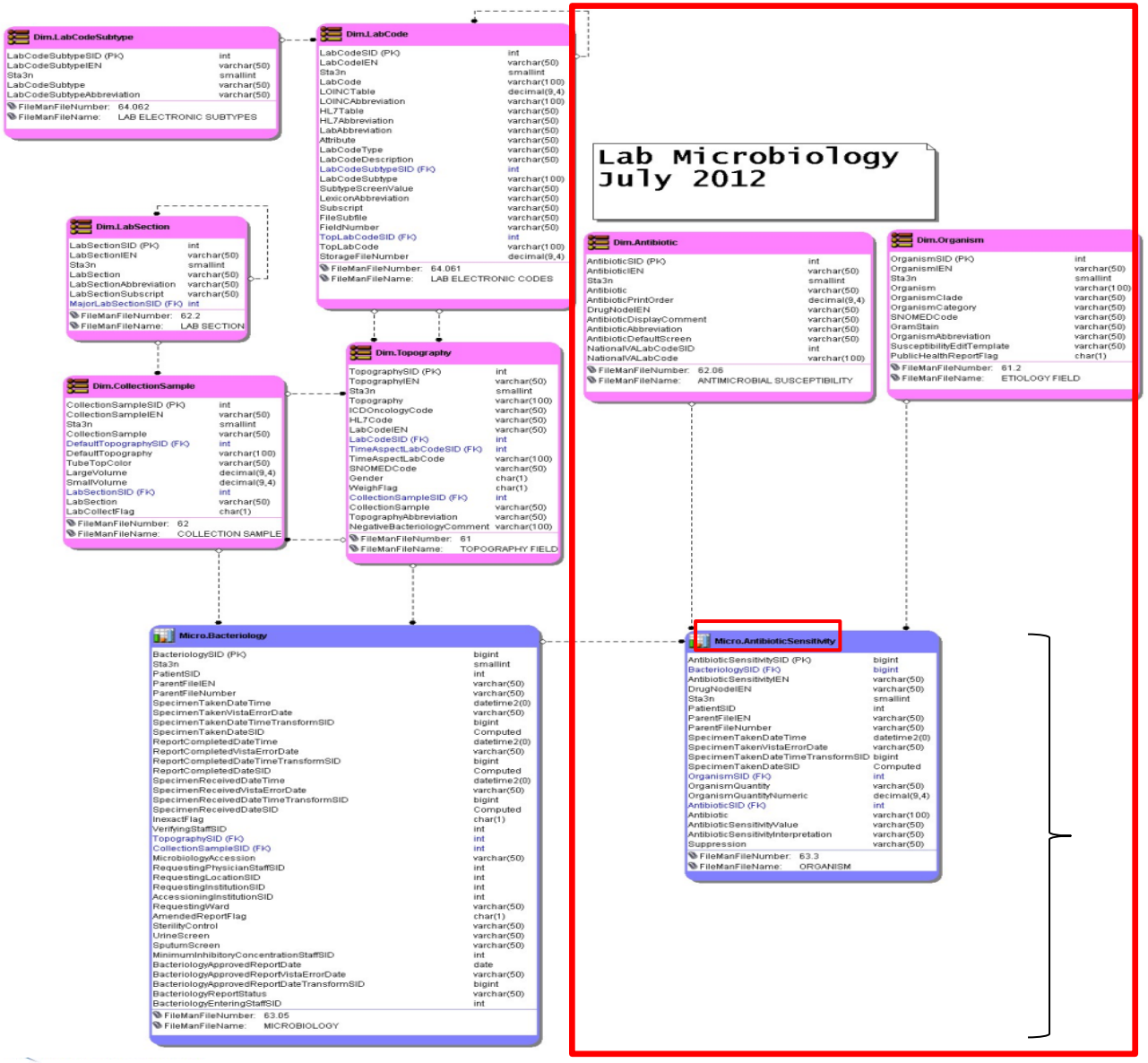
https://vaww.dwh.cdw.portal.va.gov/metadata/Reports/Images/Lab%20Microbiology_99.jpg



DIM TABLES
"Supporting" tables

FACT TABLES
"Parent" tables

Lab Microbiology 1.0 Schema



DIM TABLES
"Supporting" tables

FACT TABLES
"Parent" tables

Micro.AntibioticSensitivity

- Includes a subset of specimens from Micro.Bacteriology
  - Only positive cultures that had antibiotic susceptibility testing performed
- Includes variables that identify the antibiotic tested against and the antibiotic sensitivity results and interpretation (e.g. S, I, R)
- Additional variables include foreign keys (FK) that link to associated dim tables (or views)
- 'AntibioticSensitivitySID' is the primary key (PK)

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Dim Tables for Micro.AntibioticSensitivity

- 2 tables: Antibiotic and Organism
- Includes the actual names of the antibiotics tested against and the organisms which grew in culture
- Provides supporting information to construct an antibiogram (susceptibility testing results) for various organisms

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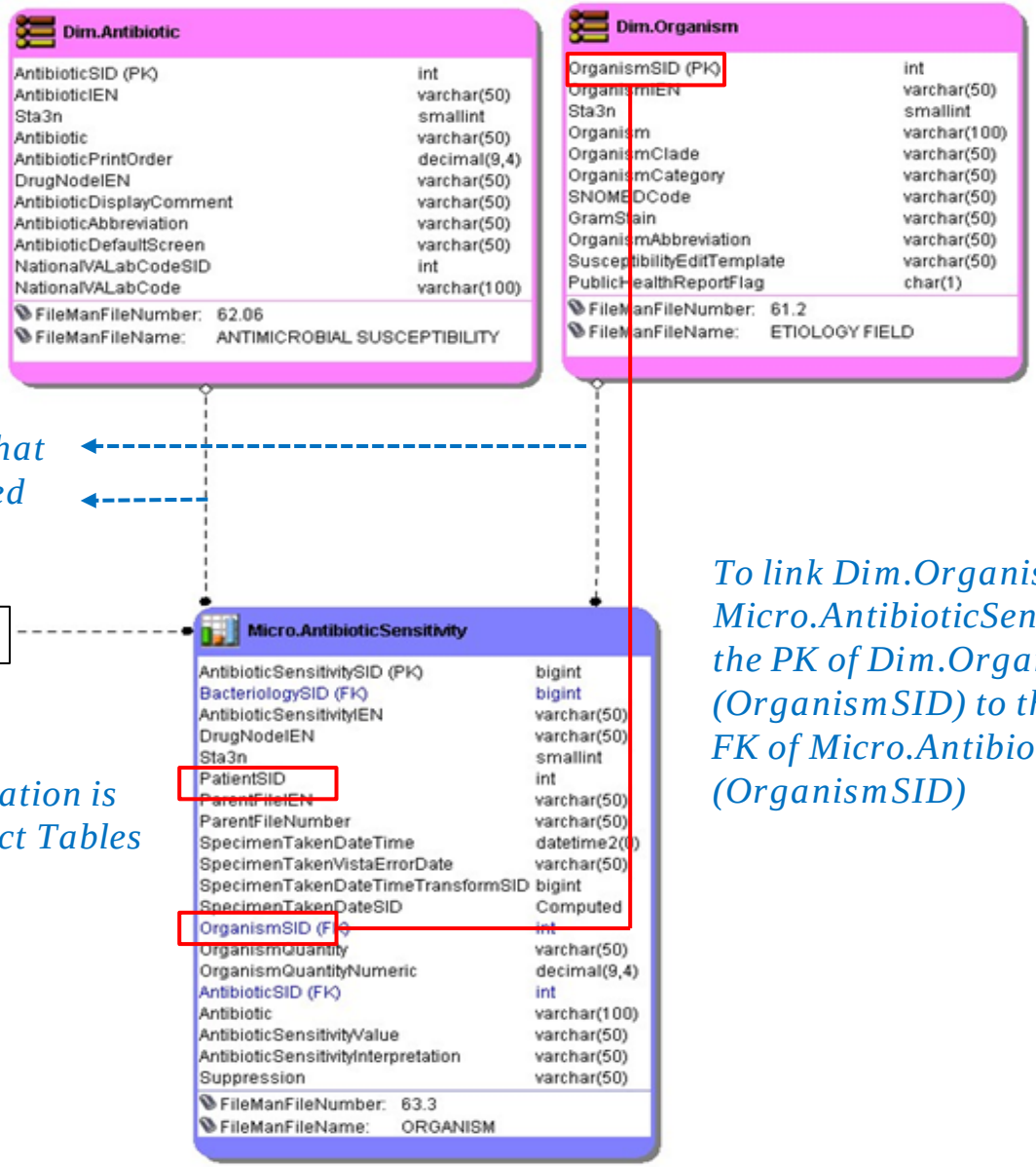
Linking between tables



Dotted lines indicate that two tables can be linked

Sensitive information is only found in Fact Tables

To link Dim.Organism to Micro.AntibioticSensitivity, match the PK of Dim.Organism (OrganismSID) to the corresponding FK of Micro.AntibioticSensitivity (OrganismSID)

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Examples for data use

- Surveillance of select bacterial infections/ colonization or drug resistance
  - Building a facility- or unit-specific antibiogram
- Risk factors, treatment, and outcomes for select bacterial infections/colonization or drug resistance
  - Identify a causative organism (example 1)
  - Identify an antibiotic resistant organism (example 2)
  - Identify source of infection (urine, blood, etc)

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Example 1:
How do I identify the causative organism in CDW Lab Microbiology?

An example using *Staphylococcus aureus*

Example 1: Identifying *Staphylococcus aureus*

- Dim.Organism table, found within CDWWork:

  In VINCI SQL Server, click on:

  Databases

  CDWWork

  Views

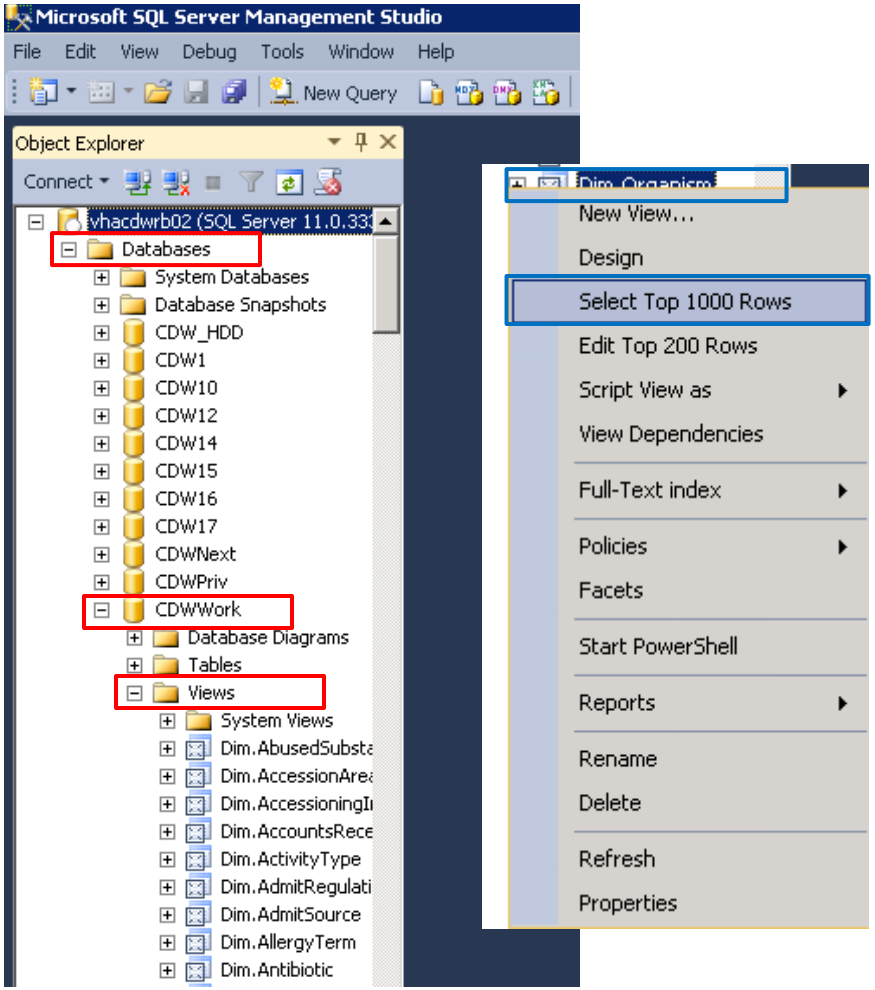
  Scroll down to:

  Dim.Organism

- View the fields contained within Dim.Organism:

  Right-click on: *Dim.Organism*

  Select Top 1000 Rows



Scroll down to find Dim.Organism

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Example 1: Identifying *Staphylococcus aureus*

- SQL Query will appear in the upper half (can edit or save)
- Results will appear in the lower half (save results by right-clicking within the results)

SQLQuery1.sql - vhacdwrb02.master - Microsoft SQL Server Management Studio

```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP 1000 [OrganismSID]
      ,[OrganismIEN]
      ,[Sta3n]
      ,[Organism]
      ,[OrganismClade]
      ,[OrganismCategory]
      ,[SNOMEDCode]
      ,[GramStain]
      ,[OrganismAbbreviation]
      ,[SusceptibilityEditTemplate]
      ,[PublicHealthReportFlag]
  FROM [CDWWork].[Dim].[Organism]
```

Fields found within Dim.Organism

File location of Dim.Organism

	OrganismSID	OrganismIEN	Sta3n	Organism	OrganismClade	OrganismCategory	SNOMEDCode	GramStain	OrganismAbbrev
1	-1	-1	-1	"Missing"			"Missing"	"Missing"	"Missing"
2	0	0	0	"Unknown at this time"		me"	"Unknown at this time"	"Unknown at this time"	"Unknown at thi
3	800000000	433	519	CLOSTRIDIUM BUTYRICU			1745	GRAM POSITIVE	NULL
4	800000001	434	519	CLOSTRIDIUM CADAVERIS	NULL	BACTERIUM	1491	GRAM POSITIVE	NULL
5	800000002	436	519	CLOSTRIDIUM DIFFICILE	NULL	BACTERIUM	1471	GRAM POSITIVE	NULL
6	800000003	437	519	CLOSTRIDIUM GLYCOLICUM	NULL	BACTERIUM	1484	GRAM POSITIVE	NULL

Results of the query

Rows = Number of results

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Example 1:
Identifying *Staphylococcus aureus*

- The SQL Query will have fields (in brackets) and the file location of Dim.Organism
- Use DISTINCT, GROUP BY and ORDER BY to see a sorted listing of the 'Organism' text-based field

```
SELECT DISTINCT([Organism])
FROM [CDWWork].[Dim].[Organism]
GROUP BY [Organism]
ORDER BY [Organism]
```

DISTINCT *limits the results to unique occurrences, and must be used with* ***GROUP BY***

File location of Dim.Organism

ORDER BY *sorts the results*

- Click on the Execute button to run the query

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Example 1: Identifying *Staphylococcus aureus*

- Here is a screen shot of the results of this query

SQLQuery

```
/****** Look only at unique or distinct Organism Entries  ******/
SELECT DISTINCT([Organism])
  FROM [CDWWork].[Dim].[Organism]
  GROUP BY [Organism]
  ORDER BY [Organism]
```

100 %

Results | Messages

	Organism
1	NULL
2	
3	SP.
4	"Missing"
5	"Unknown at this time"
6	0004 ETIOLOGIC AGENT NOT IDENTIFIED
7	0157 E.COLI 0157 (CRITICAL RESULT)
8	1(1-NAPHTHYL)-2-THIOUREA
9	1+ RBC
10	1+ WBC
11	1, 1, 1, -TRICHLORO-2, 2-BIS (P-CHLOROPHENYL) ETHANE
12	1, 1, 1-TRICHLOROETHANE
13	1, 1-DICHLORO-2-(O-CHLOROPHENYL-2-(P-CHLOROPHENY...
14	1, 1-DICHLOROETHYLENE
15	1, 3-DICHLORO-2-PROPANOL
16	1,000 CFU/ML
17	1-(1-(2-THIENYL) CYCLOHEXYL) PIPERIDINE
18	1-1-BIS-(P-CHLOROPHENYL)-2-NITROBUTANE
19	1-1-BIS-(P-CHLOROPHENYL)-2-NITROPROPANE
20	1-1-DICHLORO-1-NITROETHANE

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Example 1:
Identifying *Staphylococcus aureus*

- More edits to the query: Use the LIKE command to limit to only microorganisms which have the word "aureus" or "mrsa" (SQL is not case-sensitive)

```
SELECT DISTINCT([Organism])
FROM [CDWWork].[Dim].[Organism]
WHERE [Organism] LIKE '%aureus%'
   OR [Organism] LIKE '%mrsa%'
GROUP BY [Organism]
ORDER BY [Organism]
```

DISTINCT *limits the results to unique occurrences, and must be used with* ***GROUP BY***

File location of Dim.Organism

% *is a wild-card symbol which allows for the substitution of character(s) in a field: %end% will result in Endometrium, Pending, Friend, etc.*

ORDER BY *sorts the results*

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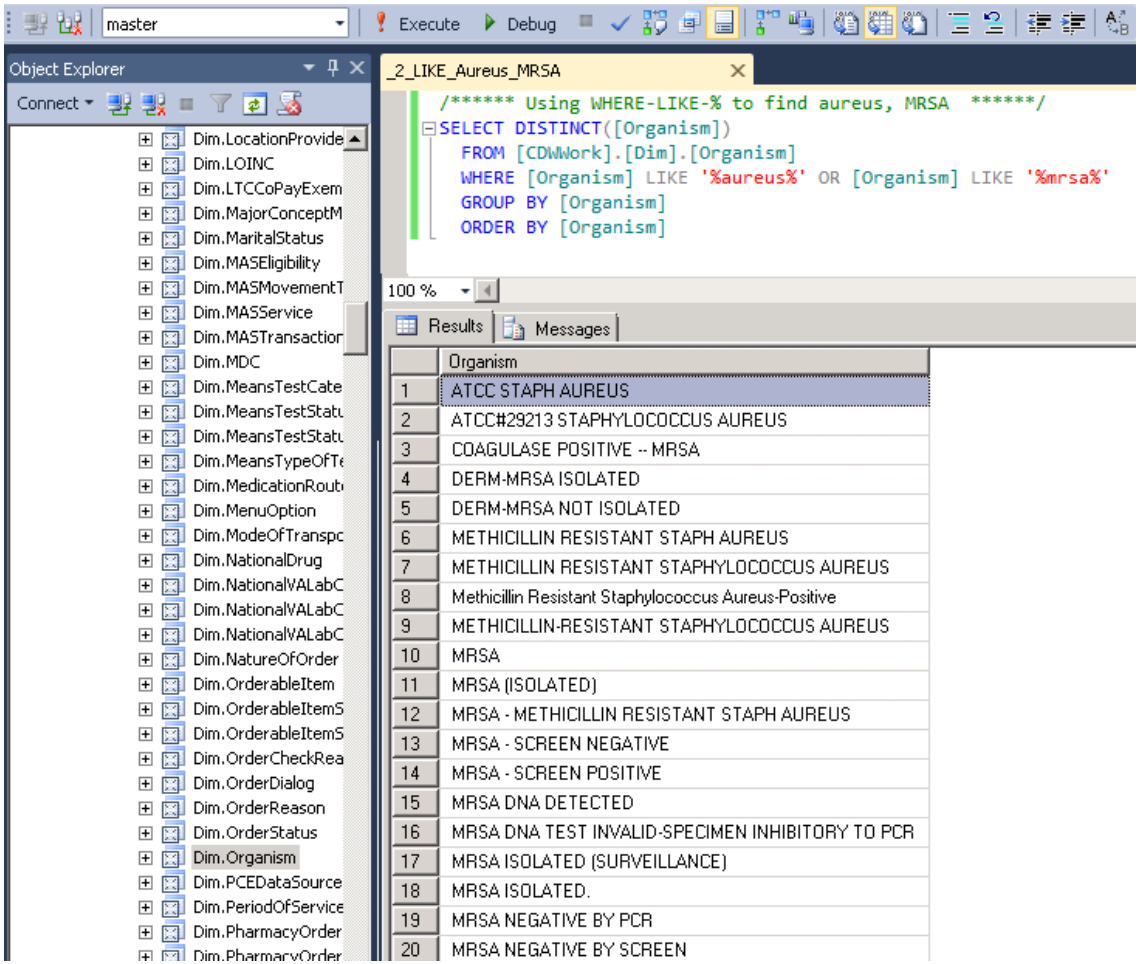
Example 1: Identifying *Staphylococcus aureus*

Note how the WHERE command limits the results to MRSA and aureus



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Example 1: Identifying *Staphylococcus aureus*

Edit the query further using the LIKE command

- Exclude records with "NEG", "NOT" or "NO " which indicate culture was negative for MRSA
- Include all records with "aureus", "MRSA", "VRSA" in the organism text
- Using text strings "COAG", "STAPH" or "VISA" will be more sensitive to identifying <u>all</u> *Staphylococcus aureus* **but** will be less specific and will get other Staph species (i.e. *Staphylococcus epidermidis*)

Execute Debug

_3_Limit_to_StaphAu...

```
SELECT DISTINCT([Organism]) AS Organism
FROM [CDWWork].DIM.[Organism]
WHERE ([Organism] NOT LIKE '%no %' AND [Organism] NOT LIKE '%not %'
    AND [Organism] NOT LIKE '%neg%')
    AND ([Organism] LIKE '%aureus%' OR [Organism] LIKE '%mrsa%'
    OR [Organism] LIKE '%vrsa%'
    OR ([Organism] LIKE '%visa%'
    AND NOT ([Organism] LIKE '%cedec%' OR [Organism] LIKE '%kleb%'
    OR [Organism] LIKE '%cerev%'))
    OR ([Organism] LIKE '%staph%'
    AND NOT ([Organism] LIKE '%auric%'
```

Several more lines are not shown

100 %

Results | Messages

	Organism
1	ATCC STAPH AUREUS
2	ATCC#29213 STAPHYLOCOCCUS AUREUS
3	COAGULASE POSITIVE -- MRSA
4	COAGULASE POSITIVE STAPHYLOCOCCUS
5	DERM-MRSA ISOLATED
6	GRAM POSITIVE COCCI IN CLUSTERS SUGGESTIVE OF STA...
7	HEMOLYTIC STAPHYLOCOCCUS SP
8	HEMOLYTIC STAPHYLOCOCCUS SP.
9	ISOLATE RESEMBLING STAPHYLOCOCCUS SP.
10	METHICILLIN RESISTANT STAPH AUREUS
11	METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS
12	Methicillin Resistant Staphylococcus Aureus-Positive
13	METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS
14	MRSA
15	MRSA (ISOLATED)
16	MRSA - METHICILLIN RESISTANT STAPH AUREUS
17	MRSA - SCREEN POSITIVE
18	MRSA DNA DETECTED
19	MRSA DNA TEST INVALID-SPECIMEN INHIBITORY TO PCR
20	MRSA ISOLATED (SURVEILLANCE)

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Example 1:
Identifying *Staphylococcus aureus*

Demonstration of misspellings and non-specific terms that identify non-*S. aureus*

Example Results from Dim.Organism:

Organism
ATCC STAPH AUREUS
ATCC#29213 STAPHYLOCOCCUS AUREUS
COAGULASE POSITIVE -- MRSA
Staphlococcus aureus
STAPHLYOCOCCUS AUREUS VANCOMYCIN INTERMEDIATE (VISA)
STAPHYLOCOCCUS (COAGULASE POSITIVE - VRSA)
STAPHYLOCOCCUS (COAGULASE POSITIVE -- NON MRSA)
Stpahylococcus aureus/S. intermedius
CEDECEAE DAVISAE
OXAC. RES. STAPH (COAG-)
STAPHYLOCOCCUS AURES/S. INTERMEDIUS
zzVANCOMYCIN-RESISTANT STAPHYLOCOCCUS EPIDERMIDIS

Misspelled words

Contains "VISA" but non-*S. aureus*

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Example 1:
Identifying *Staphylococcus aureus*

- Link your output data once you've identified all the *Staphylococcus aureus* isolates you need to Micro.AntibioticSensitivity fact table
  - Link with 'OrganismID'
  - Access to patient and specimen specific information

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Key points to Example 1

- Look at a ***full listing*** of the 'Organism' field
- Consider all possible variations of the text-based 'Organism' field in order to avoid missing any records
- High potential for alternate spellings, misspellings, phrasing, and abbreviations in the 'Organism' field
- Limitations:
  - Only includes data from bacteriology with susceptibility testing (may be missing those not sent for susceptibility testing or those not stored in bacteriology)
  - Not standardized, so requires work to ensure accurate identification of organisms

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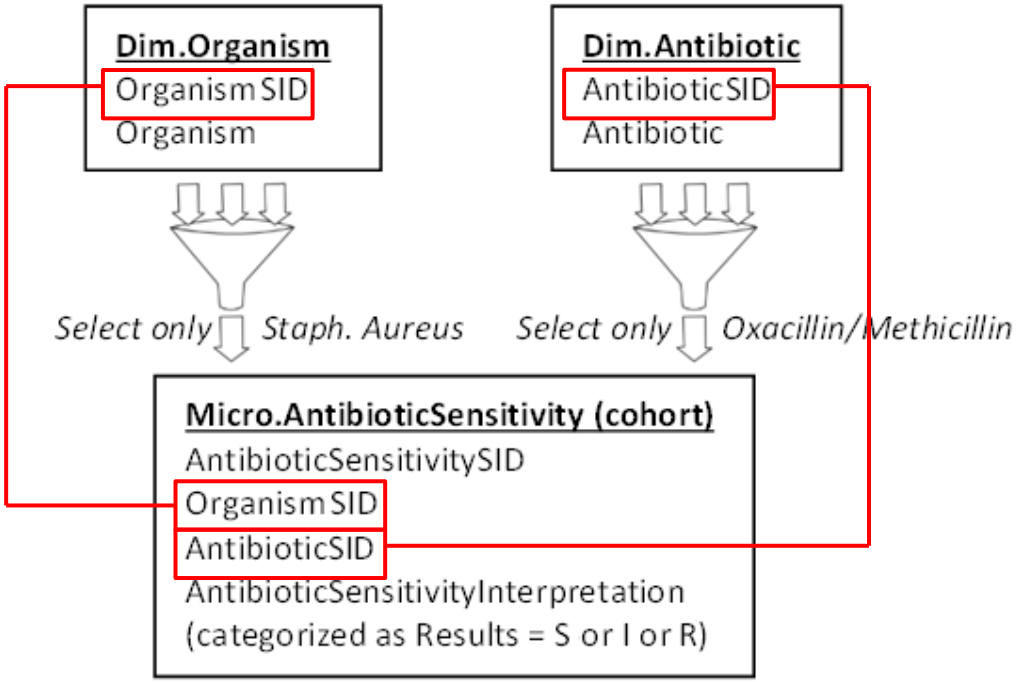
Example 2:
Identifying a Resistant Organism

An example using *Methicillin-resistant Staphylococcus aureus (MRSA)*

Example 2:
Identifying an antibiotic resistant organism

- Link 3 tables:
  - Dim.Organism (limited to *Staphylococcus Aureus*)
  - Dim.Antibiotic (limited to Oxacillin or Methicillin)
  - Micro.AntibioticSensitivity (categorized as S, I, or R)



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Example 2:
Identifying an antibiotic resistant organism

- General steps

1) Identify the organism, e.g. *Staphylococcus aureus*
2) Identify the antibiotic(s) of interest, e.g. Oxacillin or Methicillin
3) Merge with Micro.AntibioticSensitivity fact table to obtain cohort and specimen specific information and the variable field 'AntibioticSensitivityInterpretation'
4) Categorize the antibiotic sensitivity results in 'AntibioticSensitivityInterpretation' as S=Susceptible, I=Intermediate Susceptibility or R=Resistant

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Example 2:
Identifying an antibiotic resistant organism

- Step 1 (Identify the organism) was illustrated in the previous example
- Step 2 (Identify the antibiotic(s) of interest) uses the same general technique
  - Look at Dim.Antibiotic to find the field of interest
  - Look at a sorted listing of [Antibiotic]
  - Identify the antibiotic(s) of interest using LIKE

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Example 2:
Identifying an antibiotic resistant organism

DISTINCT *limits the results to unique occurrences, and must be used with* ***GROUP BY***

File location of Dim.Antibiotic

ORDER BY *sorts the results*

```
SELECT DISTINCT([Antibiotic])
  FROM [CDWWork].[Dim].[Antibiotic]
  GROUP BY [Antibiotic]
  ORDER BY [Antibiotic]
```

100 %

Results | Messages

	Antibiotic
1	*Missing*
2	*Unknown at this time*
3	0NAFCILLIN
4	1...
5	124
6	5-FLOUROCYTOSINE
7	5-FLUCYTOSINE
8	5-FLUOROCYTOSINE
9	A/S
10	ABACAVIR (DC'D)
11	ADEFOVIR
12	AM/CL-AUG
13	AMC
14	AMDINOCILLIN
15	AMIKAC 4.0 MCG/ML:
16	AMIKAC 6.0
17	AMIKACIN
18	AMIKACIN (AFB)
19	AMIKACIN 6.0
20	AMIKACIN 6.0

Screen shot of results for Dim.Antibiotic, where the field of interest is 'Antibiotic'

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Example 2:
Identifying an antibiotic resistant organism

- Use the LIKE command in the WHERE statement to limit to oxacillin or methicillin
- Here, the % symbol is used in multiple places, and the NOT command is used to exclude Amoxicillin and Cloxacillin

*The wild-card symbol **%** can be used in multiple places*

```
SELECT DISTINCT[Antibiotic]
  FROM [CDWWork].[Dim].[Antibiotic]
  WHERE ([Antibiotic] LIKE '%OXA%C%L%N%' OR [Antibiotic] LIKE '%METH%C%L%N%')
     AND NOT ([Antibiotic] LIKE '%AMOX%' OR [Antibiotic] LIKE '%CLOX%')
  GROUP BY [Antibiotic]
  ORDER BY [Antibiotic]
```

100 %

Results | Messages

	Antibiotic
1	METHCLN
2	METHCLN (7/09)
3	METHICILLIN
4	METHICILLIN SCREEN
5	OXACILLIN
6	OXACILLIN (7/09)
7	OXACILLIN (KB)
8	OXACILLIN KB
9	OXACILLIN MIC
10	OXACILLIN RESISTANCE
11	OXACILLIN SCREEN
12	OXACILLIN+2%NACL
13	OXACILLIN-MIC
14	OXACILLIN.
15	OXACILLIN2
16	OXACILLN MIC
17	OXACLIN
18	ZMETHCLN
19	ZOXACILLIN
20	ZZMETHCLN
21	zzMETHCLN 02/29/12

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Example 2:
Identifying an antibiotic resistant organism

Step 3: Merge with Micro.AntibioticSensitivity to identify susceptibility

- Merge both final data from Dim.Organism of all Staphylococcus aureus and Dim.Antibiotic of all methicillin/oxacillin records to Micro.AntibioticSensitivity fact table
- Micro.AntibioticSensitivity holds susceptibility results; fields ‘AntibioticSensitivityInterpretation’ and ‘AntibioticSensitivityValue’

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Example 2: Identifying an antibiotic resistant organism

- 'AntibioticSensitivityInterpretation' is also a text-based field, so look at the full listing in order to categorize results that are
  - S=Susceptible
  - I=Intermediate Susceptibility
  - R=Resistant
- As you can see from the text-based results, these are not standardized

SQLQuery Resistant...

```
SELECT DISTINCT([AntibioticSensitivityInterpretation])
FROM [ORD_ Project Folder].[DFLT].[Micro_AntibioticSensitivity]
```

100 %

Results | Messages

	AntibioticSensitivityInterpretation
1	R
2	S
3	.12
4	.125
5	.19
6	.25
7	<.25
8	<=.25, S
9	<=.5
10	<=.5 S
11	<=0.25
12	<=10, S
13	<=16/4
14	<=2/38
15	<=20, S
16	<=8
17	<=S
18	<0.06
19	<0.12
20	<0.5/9.5
21	<2/38
22	<8/4
23	>/=16
24	>=16, R
25	>=2
26	>=32, R
27	>=32/16
28	>=320, R

Additional results listed below

59	BLAC
60	CS
61	D
62	I**A
63	INTERMED
64	MS
65	NEG
66	POS.
67	R
68	R**N
69	RES-SYNRGY
70	See Above
71	SSUPPRESSED RESULTS
72	STAPH
73	SUPPRESSED RESULTS
74	SUSCEP
75	SYM-R
76	SYN-R
77	SYN-S
78	SYN=R
79	T

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Key points to Example 2

- Look at a ***full listing*** of the 'Antibiotic', 'AntibioticSensitivityValue', and 'AntibioticSensitivityInterpretation'field
- Consider all possible variations including alternate spellings, misspellings, phrasing, and abbreviations
- You have to link the Dimension tables Dim.Antibiotic and Dim.Organism directly to the fact table Micro.AntibioticSensitivity to get susceptibility information
- Quantitative information like MICs may be in the interpretation field and may need further categorization

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Key points to Example 2

- Use of the 'AntibioticSensitivityValue' field with the 'AntibioticSensitivityInterpretation' field in combination may be warranted
- Limitations:
  - Only includes data from bacteriology with susceptibility testing (may be missing those not stored in bacteriology; e.g. some PCR MRSA in Lab Chem)
  - Not standardized, so requires work to ensure accurate identification of antibiotics and susceptibility patterns

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Limitations to Microbiology 1.0 Data Use

- Text-based fields: Not standardized
- All specimens in VISTA bacteriology available
  - Only positive cultures with susceptibility present
  - If interested in negative cultures, must make assumptions that any specimen NOT in Micro.AntibioticSensitivity but located in Micro.Bacteriology is either negative or a positive test with no susceptibility testing
    - 'NegativeBacteriologyComment' field in Dim.Topography may assist with figuring this out (but we have not assessed this)
  - Be aware of organisms or resistance stored in other places (ie. Lab Chem)
- Only contains bacteriology data for now
  - Update expected to include virology, parasitology, and mycology
  - Lab Microbiology 2.0 coming soon
- Data quality has not been assessed

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Lab Microbiology 1.0 Strengths

- Only integrated health system with millions of records of national microbiology data

  This is great!!

- Opportunity to answer epidemiology and health services and outcomes research questions on infectious disease that otherwise would not be possible with one or two sites

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Poll #3: Planned use

- What are your future plans for using CDW microbiology data? (Select all that apply)
  - I do not plan to use these data in the future
  - Assess risk factors for infection or antibiotic resistance
  - Assess treatment or management for infections
  - Evaluate outcomes (morbidity, mortality, or costs) for infection
  - Conduct surveillance or infection control activities
  - Develop facility or unit specific antibiograms
  - Evaluate impact of national initiatives on infections
  - Other (please specify)

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Other Resources

- VHA Data Portal
  - Provides information on VHA data sources and access
  - Direct link to CDW page in Data Portal
  - http://vaww.vhadataportal.med.va.gov/DataSources/CDW.aspx

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Other Resources

- VIReC CDW Overview
  - Provides basic information and resources for researchers interested in CDW data
  - http://vaww.virec.research.va.gov/CDW/Overview.htm
- VIReC CDW Summary Documentation
  - Provides researchers an overview to CDW data with domain layouts, data contents, sample records, and data frequencies.
  - http://vaww.virec.research.va.gov/CDW/Documentation.htm

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Other Resources

- VINCI Data Description
  - Provides VINCI descriptions to variables within Lab Microbiology 1.0 data.
  - http://vaww.vinci.med.va.gov/vincicentral/documents/Data_Descriptions/Microbiology_Data_Description.pdf
- CDW Metadata
  - Offers an in-depth description of the fact and dim tables and variables within these tables for all CDW data including Lab Microbiology.

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VIReC Help

- HSRData Listserv
  - Join at the VIReC Web Site
  - Discussion among users
  - Past messages are archived on intranet
- VIReC Help Desk
  - VIReC@va.gov
  - (708) 202-2413

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Questions?

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