Before The Session Starts

- Log into wifi (see paper on table for the password)
- Web to https://github.com/PhilaHFMA/Analytics-Boot-Camp
- Download
  - Analytics Boot Camp.zip OR
  - All individual files

Healthcare Analytics Boot Camp

March 29, 2017

hfma metropolitan philadelphia chapter healthcare financial management association

Objectives

- Overall – enhance the ability of Phila-area healthcare financial professionals to analyze population health data from advanced payment models
- Create understanding of basic concepts of data modelling
- Introduce easily-available tools for data analysis, with some hands-on experience, and create a common platform within the group
- Fill in gaps of knowledge about computer-related issues
- Learn some best practices about analysis and data visualization

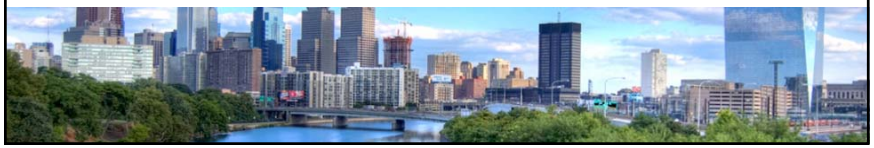
Agenda

Morning Session

- Computer hardware and software overview
- Database theory
- SQL Server intro
- Importing into Excel using Power Query
- Building and analyzing data models using PowerPivot

Afternoon Session

- Using R for data analysis (Muthersbaugh)
- PowerShell (Milano)
- Networking and FTP transfer (Pearce)
- HIPAA issues and data encryption (Rossi)
- Effective data visualization (Junker)



What You Should Have Now

Installed software

- Excel 2013/2016 with PowerPivot and Power Query
- SQL Server Express with Management Studio
- R
- Em editor
- WinZIP
- FileZilla

Sample data files (CSV)

- Claims
- DRGs
- Members
- MemberMonths
- BadMembers
- HCPCS
- MedicalSpecialties
- HCPCS.txt
- HCPCS2.txt

Sample SQL scripts

Overview of Computer Hardware and Software

Memory vs Disk Space?

16 gigabytes (gb) = 16 billion bytes

2 terabytes (tb) = 2 trillion bytes

Computer Memory

Inadequate computer memory is like working at a tiny desk…

….in order to get everything done, you'll have to trade out work resources.

This slows things down!

Having ample computer memory is like having a big desk.

No time wasted swapping things in and out!

How Much Memory Can Your Computer Use?

32-bit vs. 64-bit memory address

What's "bits" got to do with it?	• Impacts length of memory location address • Address length is in "bits"

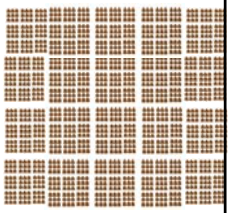
What if a house address can only be **one digit** (or bit) long?

You could only address **9 houses**, even if more house exist.

Two digits?

99 houses

Nine digits?

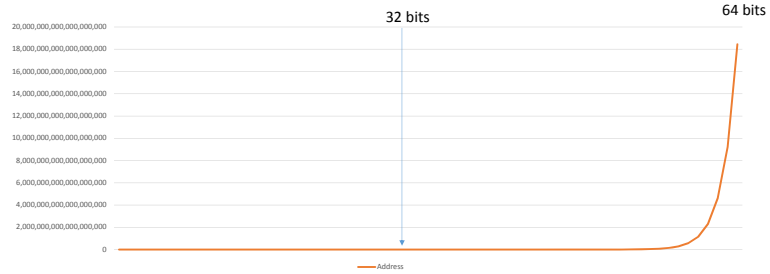


You get the picture…

How Much Memory?

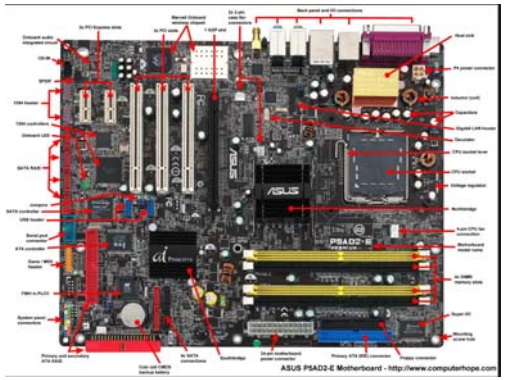
32 bits = 2^{32}= 4 billion bytes = 4 gb, or less

64 bits = 2^{64} = 18 quintillion bytes = 18 million gb



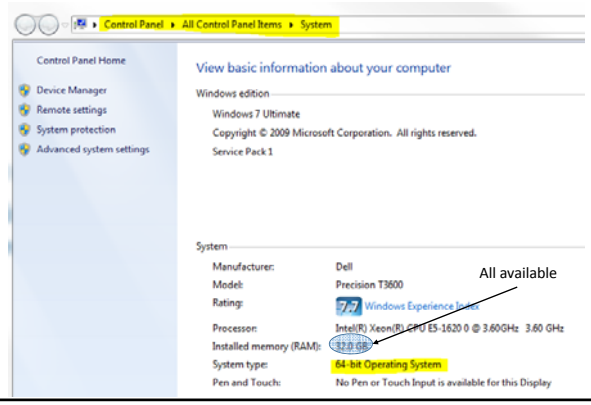
What Affects Word Size?

- Hardware



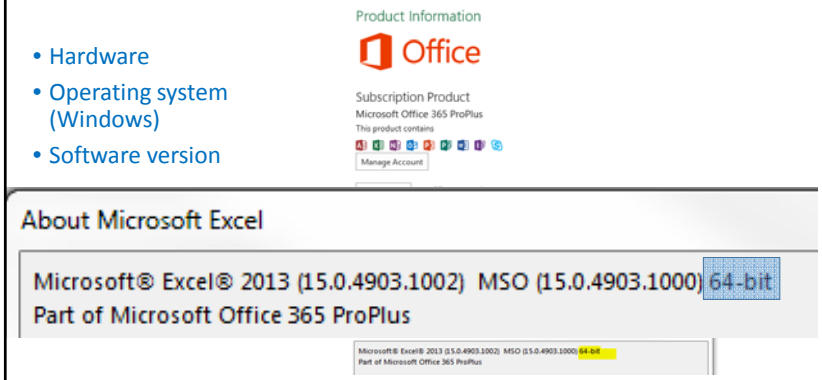
What Affects Word Size?

- Hardware
- Operating system (Windows)



What Affects Word Size?

- Hardware
- Operating system (Windows)
- Software version

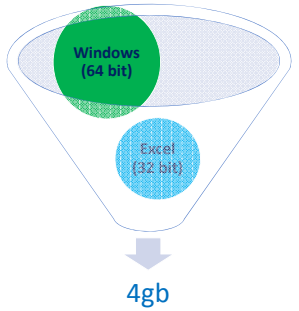


More on Computer Memory

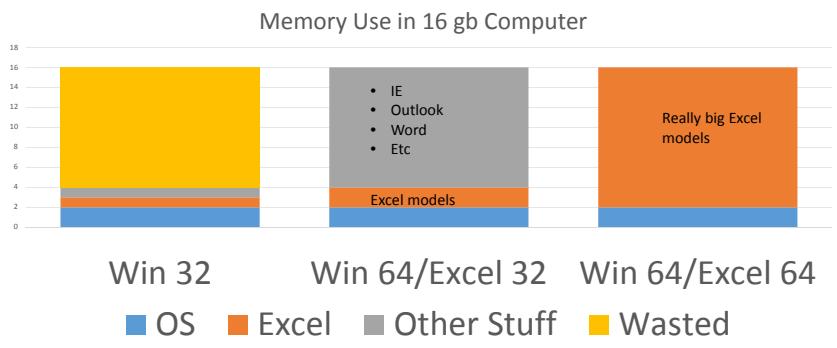
Addressing Space of a Computer is Constrained by:

1. Physical capability of the computer
2. Capacity of Windows version
3. Capacity of application program installed

Smallest = most limiting



Why It Matters



So How Do You Fix It?

Get IT to install the 64-bit version of Microsoft Office (which they should have done in the first place…)

DATA TYPES

Spreadsheet vs. Database Data

Spreadsheet	Database
• Free-form • Fields don't have names • Fields don't have enforced data types	• Consists of FIELDS and RECORDS • Consistent data in columns (database fields) • Each row (record) is in the same type as all others

Which of these is database format?

Principal amount	$	100,000
Interest rate		8%
Term		4
Payment	$	(30,192)

Name	Specialty	Age	City	State
Smith	Cardiology	42	Bala Cynwyd	PA
Jones	Dermatology	36	Marlton	NJ
Watson	General Surgery	70	Philadelphia	PA
Miller	Orthopedics	51	Merion	PA

Types of Data

- Numbers
- Character data (string, text)
- Dates
- Binary
- XML data
- EDI data

Numbers

Integers

- Takes less file space
- Contain no decimal places
- Always shows exact integer values
- Arithmetic operators may result in incorrect integer results (3/2=1)
- Appropriate for counts, ages, identifiers

Floating point

- Takes more file space
- May not show integer values exactly (1.0000000001)
- Appropriate for dollar amounts, measurements

Character Data

- May contain characters, text, punctuation and spaces
- Numeric data cannot be used in calculations
- String functions can be used (LEFT, RIGHT, MID or SUBSTRING, LEN)
- May have defined or variable length

Dates

Dates know that they are dates

- Don't accept invalid date values (2/31/2007)
- Can be formatted in different ways (1/31/07; January 1, 2007)
- Accept date arithmetic (DATEDIFF, YEAR, MONTH)

Note

Text data may have to be converted to a date

May also include time

Binary

- One bit
- Yes/no
- Present/absent
- Member/non-member
- Complete/incomplete

XML Data

```
<st:weatherForecast>
      <st:daily date="2007-05-11T04:00:00Z" high="81" low="58">
        <st:detail time="2007-05-11T17:00:00Z" temp="81"
cloud="-1" conditions="" likelyConditions="T-storms" />
      </st:daily>
      <st:daily date="2007-05-19T04:00:00Z" high="69" low="52">
        <st:detail time="2007-05-19T17:00:00Z" temp="69"
cloud="-1" conditions="" likelyConditions="Partly Cloudy" />
      </st:daily>
</st:weatherForecast>
```

Data Modelling
Dimensions and Measures

Overview of Dimensional Modeling

- ✓Break down data into "fact tables" and "dimension tables"
  - Separate descriptive dimension data from numeric data
- ✓Separate fields into "dimensions" and "measures"
- ✓Create "keys" to link fact and dimension tables

What is a Dimensional Model?

- Designed for ease of querying, not for transactional updates
- Built to support aggregate queries
- Modelled around business subject areas

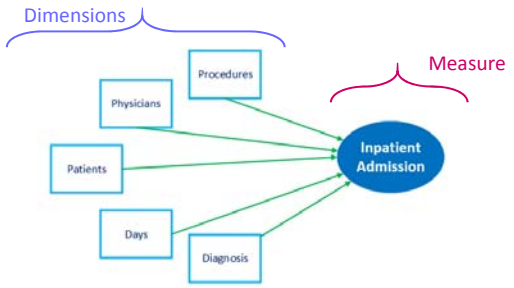
Advantages of Dimensional Models

- Eliminate data redundancy
- Allow maintenance of reference data
- Create consistency in data
- Easily extensible
- Standardized approaches to common situations
  - Slowly-changing dimensions
- Program infrastructures that use dimensional models for rapid reporting
  - PowerPivot
  - Analysis Services

Measures & Dimensions

There are two main types of objects in a dimensional model

1. **Measures** are quantitative metrics that we wish to analyse and report on.
2. **Dimensions** contain textual descriptors of the business. They provide *context* for the facts.



Building a Model – "Fact" Tables

- Fact tables contain **measures**
- Identify measures by looking for **quantitative values that are** reported.
- Measures are linked to dimensions by **keys**

Fact Tables

- Contain measures
- Contains foreign keys
- Tend to have huge numbers of records
- Useful facts tend to be numeric and additive

A "foreign key"?

A **foreign key** is a column or group of columns in a relational database table that provides a link between data in two tables.

Building a Model - Dimensions

- Identify Dimensions by listening for "by" words.
- Look for related attributes that should be part of a single dimension.
- Pay attention to how "Dimensions" change over time and in relation to each other.

"Slowly-changing dimensions"

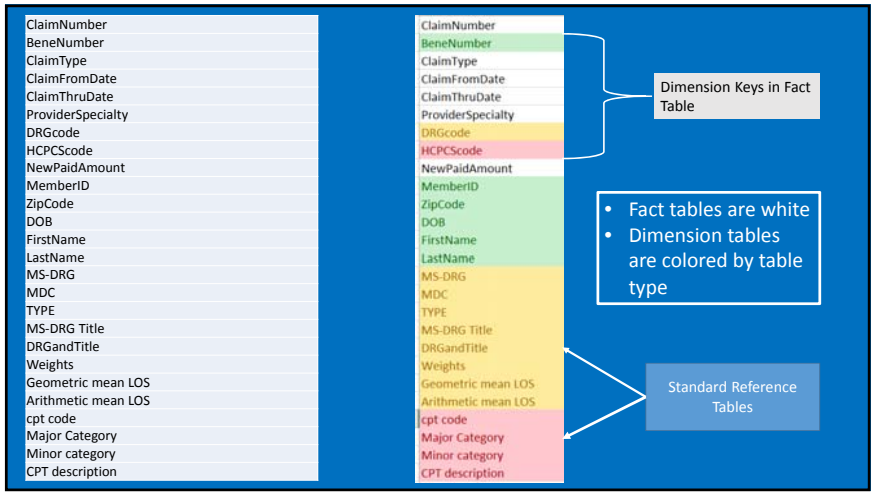
"By" Words

- Inpatient admission **by DRG**
- Inpatient admission **by length of stay**
- Major joint replacement episode **by operating physician**
- Major joint replacement episode **by discharge disposition**

Dimensions that change over time
- Names change
- People move
- People get transferred
- Terms get redefined

ClaimNumber	BeneNumber	ClaimType	ClaimFromDate	ClaimThruDate	ProviderSpecialty	DRGCode	HCPCScode	NewPaidAmount	MemberID	ZipCode	DOB	FirstName	LastName	MS-DRG	MDC	TYPE	MS-DRG Title	DRGandTitle	Weights	Geometric mean LOS	Arithmetic mean LOS	cptcode	Major Category	Minor category	CPT description
1023	14	71-Carrier Non-DME	2/2/2014	2/2/2014	30	NULL	G0206	0	14	2715	7/11/1947	MICHELLE	MELLO	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	G0206	HCPCS Codes	Temporary Codes	G0206 Diagnosticmammographydigital
1023	14	71-Carrier Non-DME	2/2/2014	2/2																		77051	Radiology	Unknown	77051 Computer dx mammogram add-on
2552	45	71-Carrier Non-DME	5/3/2014	5/3/2014	11	NULL	99213	66.54	45	1749	10/17/1963	BARBARA	SACCO	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	99213	E&M	Low/Moderate Severity	99213 Office/Outpatient Visit, Est
2552	45	71-Carrier Non-DME	5/3/2014	5/3/2014	11	NULL	85610	5.69	45	1749	10/17/1963	BARBARA	SACCO	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	85610	Pathology	Hematology/Coagulation	85610 Prothrombin Time
2578	53	71-Carrier Non-DME	5/10/2014	5/10/2014	50	NULL	99214	78.26	53	1561	1/8/1940	FERN	EBERT	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	99214	E&M	Moderate/High Severity	99214 Office/Outpatient Visit, Est
2591	30	71-Carrier Non-DME	3/23/2014	3/23/2014	22	NULL	G0462	85	30	1609	2/19/1936	MARTHA	PRODROMIDIS	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	G0462	NULL	NULL	G0462 Immunohisto/cyto chem add
		71-Carrier Non-											PRODR												G0461 Immunohisto/cyto chem

Which fields are **FACTS** and which are **DIMENSIONS**?



Grain (unit of analysis)

The grain determines what each fact record represents: the level of detail.

- For example
  - Individual transactions, vs
  - Summaries by selected dimension (i.e., CPT code)
- Smallest grain gives greatest flexibility but also the largest data set

Example
Time: Year – quarter – month – week – day

What Have We Covered So Far?

- Table types
  - Fact tables
  - Dimension tables
- Types of fields in tables
  - Measures
  - Dimension keys
  - Dimension data

TABLE KEYS

Keys – table fields used to reference other fields

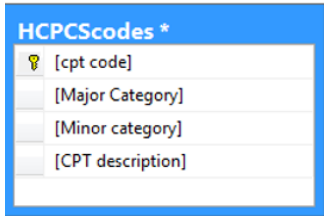
- Primary keys – unique values for linking to data

  vs
- Foreign keys – non-unique values for linking to primary keys
- Natural keys occur in the data

  vs
- Surrogate keys must be created from multiple fields to create uniqueness
  - Important for slowly-changing dimensions

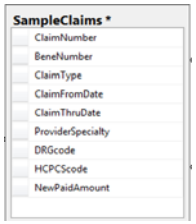
Primary Key

- Used in a DIMENSION table
- Uniquely identifies a row
- Cannot have duplicates
- Examples:
  - DRG Code
  - HCPCS code

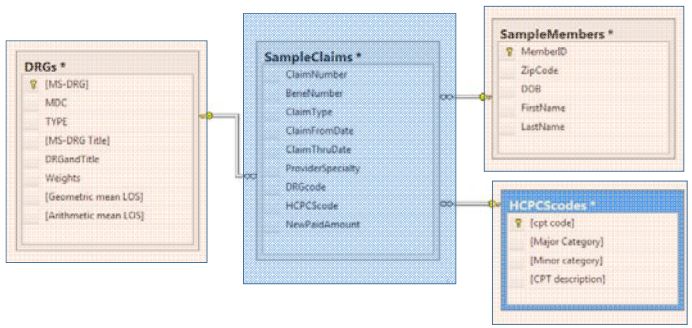


Foreign Key

- Used in a FACT TABLE
- Links to a PRIMARY KEY
- Can have duplicates



Relationship Diagram



Natural Key

- Can be primary or foreign
- Occurs naturally in data
  - HCPCS code
  - DRG code

Surrogate Key

- Used when no data element in the data is unique
- Doesn't occur naturally in the data
- Can be created by combining data elements (Member ID + reporting month)
- ICD-9 vs ICD-10

Natural Key is Primary

MemberID	ZipCode	DOB	FirstName	LastName
6	1581	10/8/1933	CAROL	CAMPBELL
7	1569	4/16/1946	HARRY	CRUZ
8	1607	3/26/1939	HANNAH	HALE
9	1005	6/10/1966	GERALDINE	MALCOLM
10	1420	7/27/1918	SONIA	RODENHISER
11	1432	2/7/1994	ABIGAIL	VALLEY
12	1420	1/1/1948	ROBERT	STOCKHAUS

Surrogate Key Needed

Month	MemberID	ZipCode	DOB	FirstName	LastName
1/1/2016	6	1581	10/8/1933	CAROL	CAMPBELL
1/1/2016	7	1569	4/16/1946	HARRY	CRUZ
1/1/2016	8	1607	3/26/1939	HANNAH	HALE
1/1/2016	9	1005	6/10/1966	GERALDINE	MALCOLM
1/1/2016	10	1420	7/27/1918	SONIA	RODENHISER
1/1/2016	11	1432	2/7/1994	ABIGAIL	VALLEY
1/1/2016	12	1420	1/1/1948	ROBERT	STOCKHAUS
2/1/2016	6	1581	10/8/1933	CAROL	CAMPBELL
2/1/2016	7	1569	4/16/1946	HARRY	CRUZ
2/1/2016	8	1607	3/26/1939	HANNAH	HALE
2/1/2016	9	1005	6/10/1966	GERALDINE	MALCOLM
2/1/2016	10	1420	7/27/1918	SONIA	RODENHISER
2/1/2016	11	1432	2/7/1994	ABIGAIL	VALLEY
2/1/2016	12	1420	1/1/1948	ROBERT	STOCKHAUS
3/1/2016	6	1581	10/8/1933	CAROL	CAMPBELL
3/1/2016	7	1569	4/16/1946	HARRY	CRUZ
3/1/2016	8	1607	3/26/1939	HANNAH	HALE
3/1/2016	9	1005	6/10/1966	GERALDINE	MALCOLM
3/1/2016	10	1420	7/27/1918	SONIA	RODENHISER
3/1/2016	11	1432	2/7/1994	ABIGAIL	VALLEY
3/1/2016	12	1420	1/1/1948	ROBERT	STOCKHAUS

That's The End of Database Theory

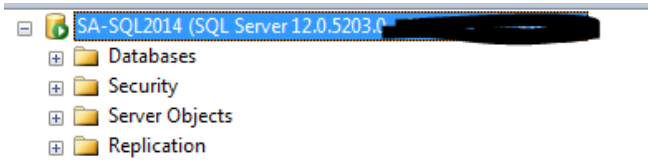
Hands-On with SQL Server, Power Query and PowerPivot

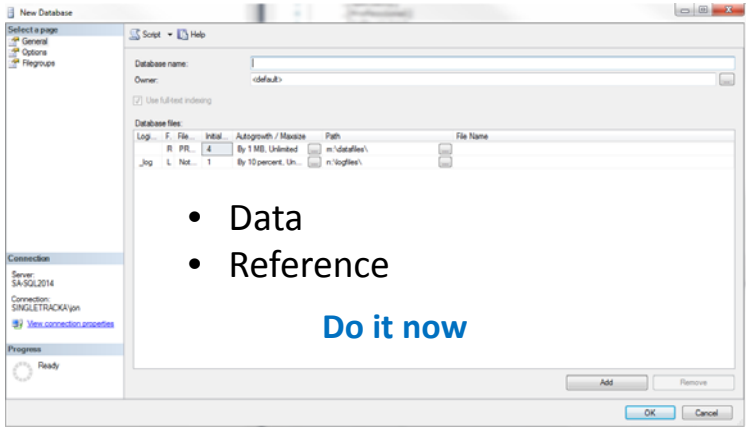
SQL Server Tasks

- Open SQL Server Management Studio
- Create two databases – DATA and REFERENCE
- Load CSV files
  - DATA database
    - Claims
    - Members
    - MemberMonths
  - REFERENCE database
    - DRGs
    - HCPCS
    - MedicalSpecialties
- Refer to Sample SQL Scripts

Create Database

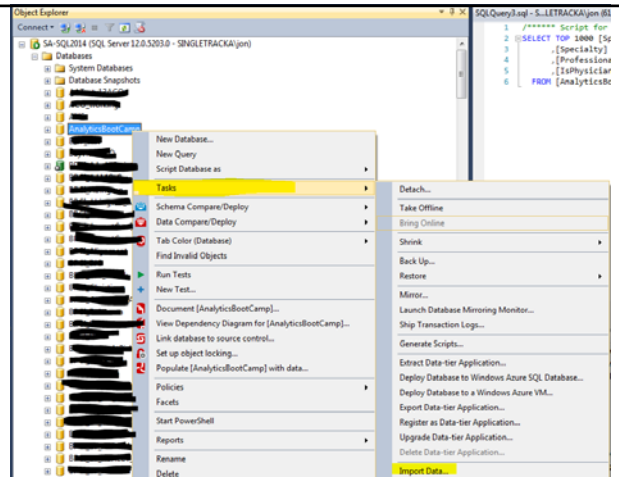
- Open SQL Server Management Studio
- Right-click on server name
- Create Database



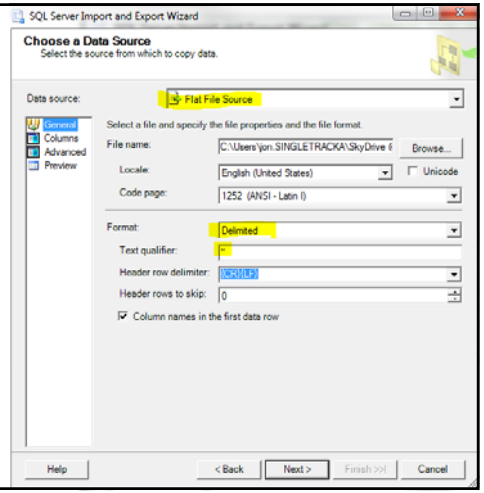


- Data
- Reference

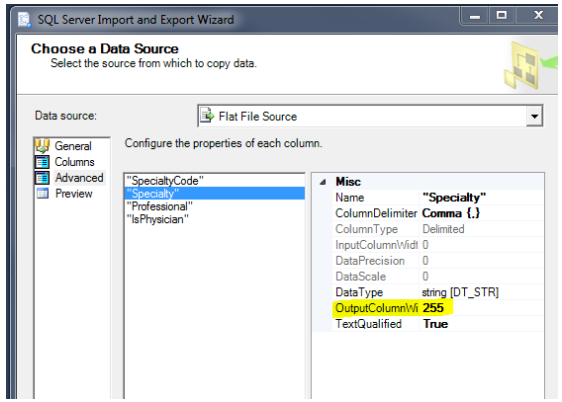
Do it now



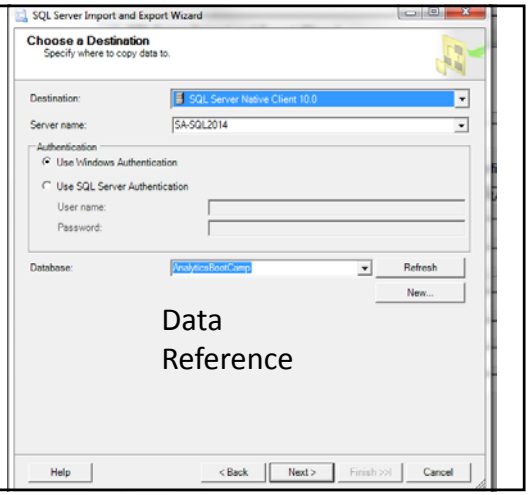
Data Source



Larger output column width for long text fields



Destination



Data
Reference

Do It Now

- Load CSV files
  - DATA database
    - Claims
    - Members
    - MemberMonths
  - REFERENCE database
    - DRGs
    - HCPCS
    - MedicalSpecialties

See SQL Scripts.sql

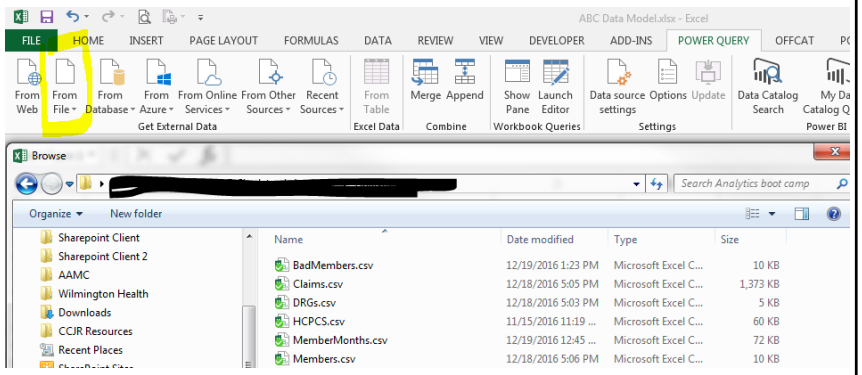
```
SELECT TOP 1000 [ClaimNumber]
    ,[BeneNumber]
    ,[ClaimType]
    ,[ClaimFromDate]
    ,[ClaimThruDate]
    ,[ProviderSpecialty]
    ,[DRGcode]
    ,[HCPCScode]
    ,[NewPaidAmount]
FROM [AnalyticsBootCamp].[dbo].[SampleClaims]

SELECT * FROM [dbo].[SampleClaims]
```

SQL Demo and Playtime

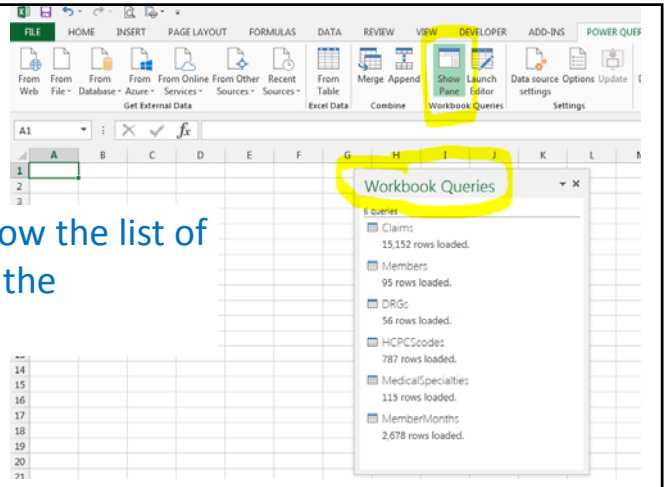
Power Query Overview

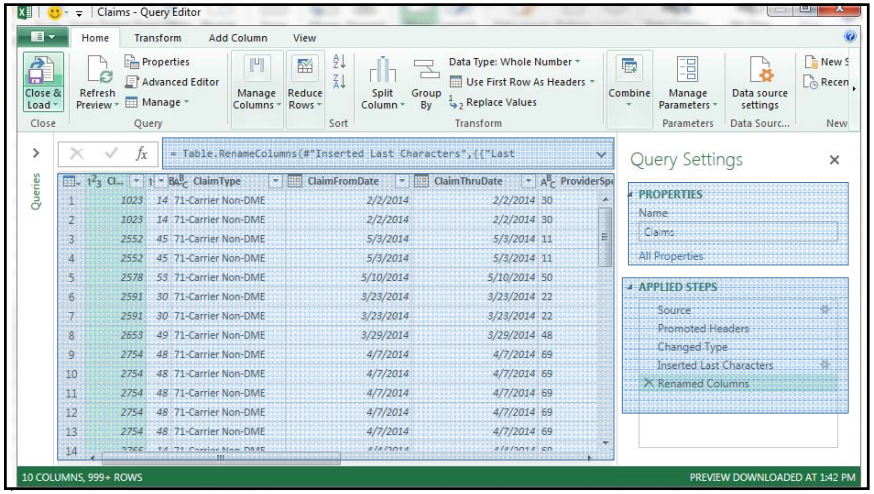
- Add-in for Excel 2013; integrated in DATA > New Query in Excel 2016
- Powerful Extract, Transform and Load (ETL) tool
- Tasks
  - Load CLAIMS, MEMBERMONTHS and MEMBERS table into Data Model (PowerPivot)
  - Explore other PowerQuery functions

Loading CSV into PowerQuery

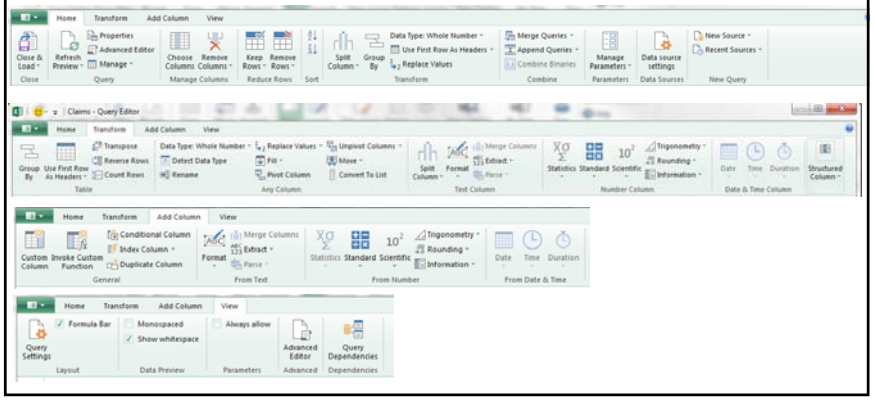


How to show the list of queries in the workbook





Power Query Toolbars



PowerQuery – Load Multiple HCC Columns

- 189 columns of HCC data
- Need count of members by HCC
- PowerQuery Steps:
  - Select model
  - Select Table 1-1 – Edit
  - 
  - mns
  - HCC columns
  - ote character
  -],Text.Length([Attri
  - Load to Data Model
- PowerPivot Steps
  - Create pivot table

Row Labels	Sum of Value
HCC1	26
HCC10	238
HCC100	479
HCC103	148
HCC104	20
HCC106	73
HCC107	342
HCC108	1924
HCC11	362
HCC110	4
HCC111	2446
HCC112	291
HCC114	102
HCC115	22
HCC12	1277
HCC122	176
HCC124	285
HCC134	136
HCC135	600
HCC136	63

Power Query Demo and Playtime

PowerPivot – the Desktop Analytics Game-changer

- Multidimensional analytics engine
- Taken from SQL Server Analysis Services (OLAP) Tabular Model
- Grafted onto Excel 2010
- Added into Excel 2013
- Integrated into Excel 2016

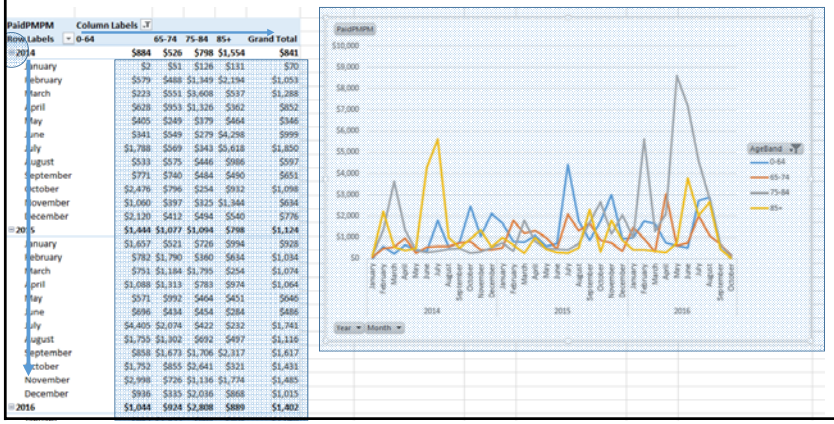
What Does PowerPivot Do?

- Allows stream-of-consciousness analysis using Excel functionality
  - Pivot tables
  - Pivot graphs
- Allow huge databases (millions of rows)
- High level of data compression (20 to 1 or greater)
- Allows relationships
- Programming language (DAX)
- Maintains Excel Objects (graphs and tables) when transferring to Word or PowerPoint

PowerPivot Demo and Tasks

- Load the CLAIMS, MEMBERS and MEMBERMONTHS tables from PowerQuery
- Link the DRG, Medical Specialties and HCPCS tables from SQL
- Add data with Linked Tables
- Create custom columns
- Create aggregate formulas
- Show DAX functions
- Summarize with pivot tables and charts

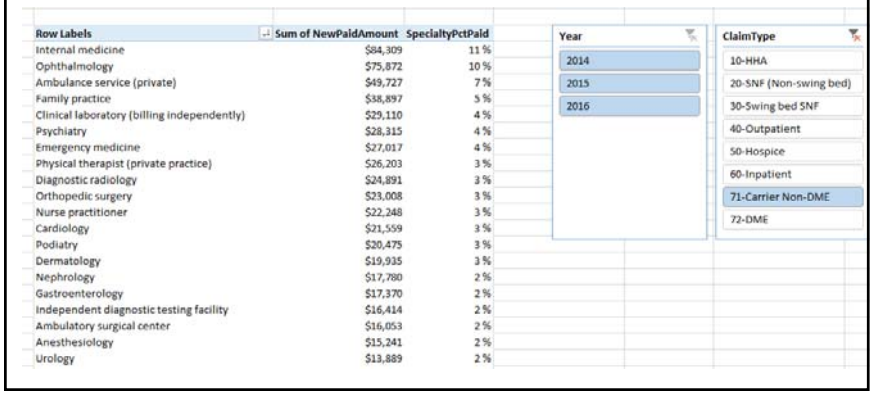
The Final Goal



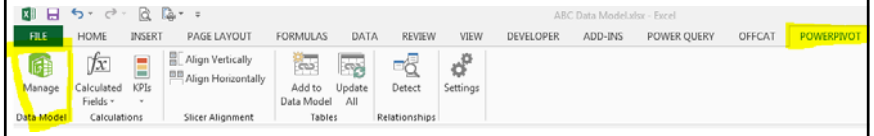
PaidPMPM	Column Labels				
Row Labels	0-64	65-74	75-84	85+	Grand Total
2014	$884	$526	$798	$1,554	$841
January	$2	$51	$126	$131	$70
February	$579	$488	$1,349	$2,194	$1,053
March	$223	$551	$3,608	$537	$1,288
April	$628	$953	$1,326	$362	$852
May	$405	$349	$379	$464	$346
June	$341	$549	$279	$4,298	$999
July	$1,788	$569	$343	$3,618	$1,850
August	$533	$575	$446	$986	$597
September	$771	$740	$484	$490	$651
October	$2,476	$796	$254	$932	$1,098
November	$1,060	$397	$325	$1,344	$634
December	$2,120	$412	$494	$540	$776
2015	$1,444	$1,077	$1,094	$798	$1,124
January	$1,657	$521	$726	$994	$928
February	$782	$1,790	$360	$634	$1,034
March	$751	$1,184	$1,795	$254	$1,074
April	$1,088	$1,313	$783	$974	$1,064
May	$571	$992	$464	$451	$646
June	$696	$434	$454	$284	$486
July	$4,405	$2,074	$422	$232	$1,741
August	$1,755	$1,302	$692	$497	$1,116
September	$858	$1,673	$1,706	$2,317	$1,617
October	$1,752	$855	$2,641	$321	$1,431
November	$2,998	$726	$1,116	$1,774	$1,485
December	$936	$335	$2,036	$868	$1,015
2016	$1,044	$924	$2,808	$889	$1,402

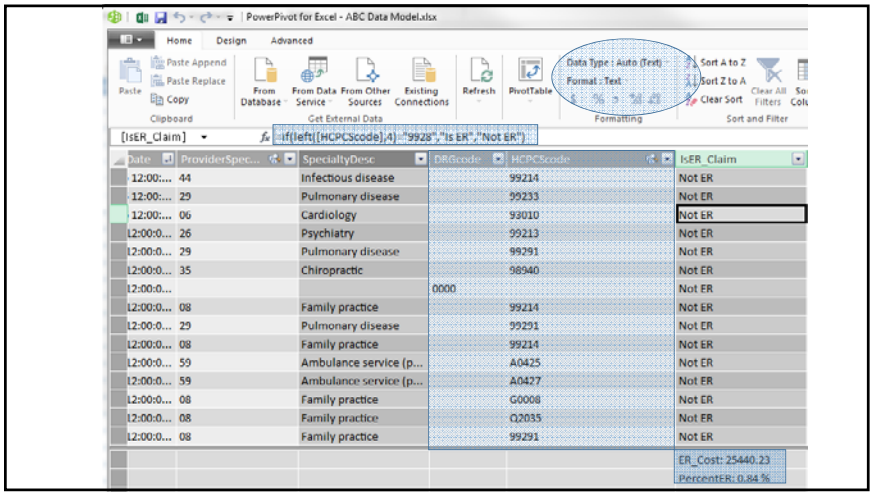
...or ...

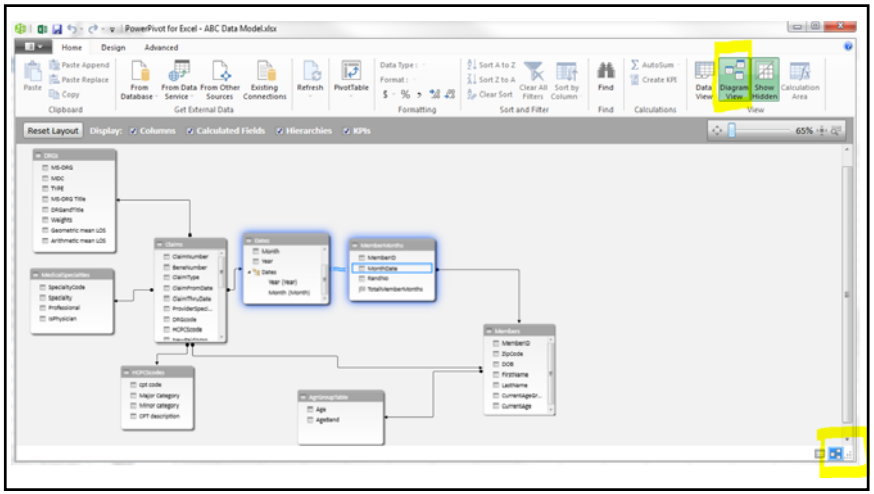
Row Labels	Sum of NewPaidAmount	SpecialtyPctPaid
Internal medicine	$84,309	11 %
Ophthalmology	$75,872	10 %
Ambulance service (private)	$49,727	7 %
Family practice	$38,897	5 %
Clinical laboratory (billing independently)	$29,110	4 %
Psychiatry	$28,315	4 %
Emergency medicine	$27,017	4 %
Physical therapist (private practice)	$26,203	3 %
Diagnostic radiology	$24,891	3 %
Orthopedic surgery	$23,008	3 %
Nurse practitioner	$22,248	3 %
Cardiology	$21,559	3 %
Podiatry	$20,475	3 %
Dermatology	$19,935	3 %
Nephrology	$17,780	2 %
Gastroenterology	$17,370	2 %
Independent diagnostic testing facility	$16,414	2 %
Ambulatory surgical center	$16,053	2 %
Anesthesiology	$15,241	2 %
Urology	$13,889	2 %

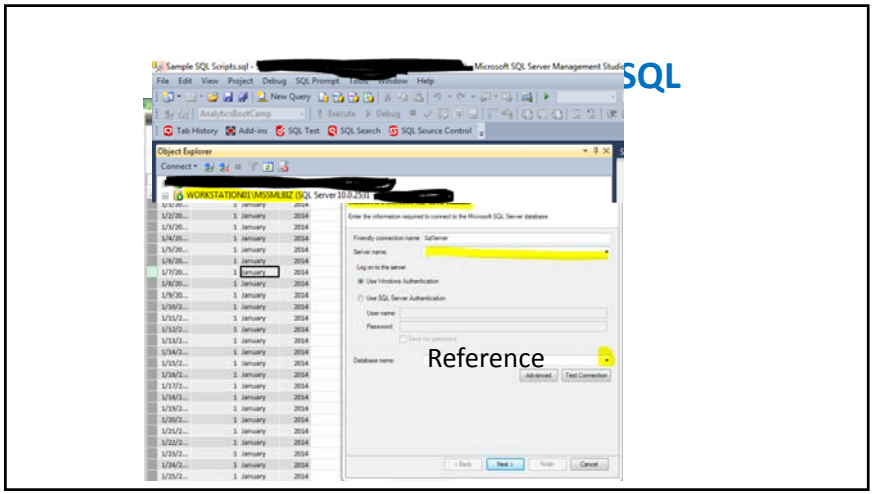


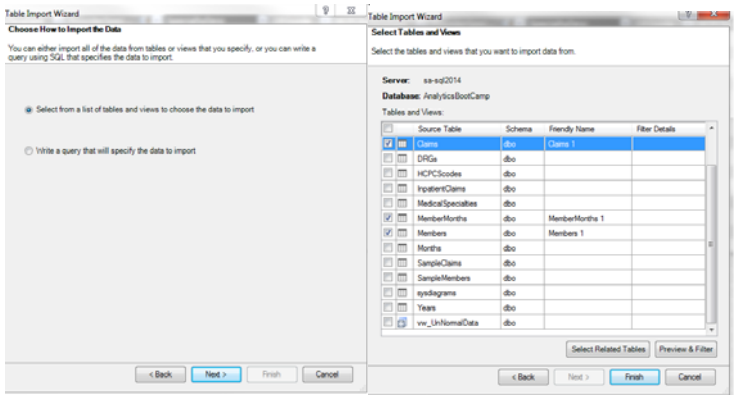
First Look at the Data Model (PowerPivot)







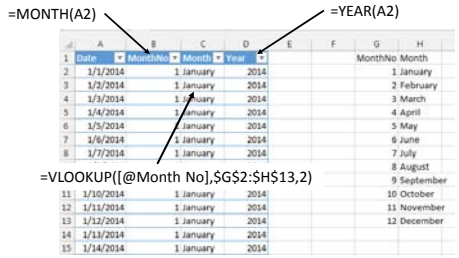




Do that step now

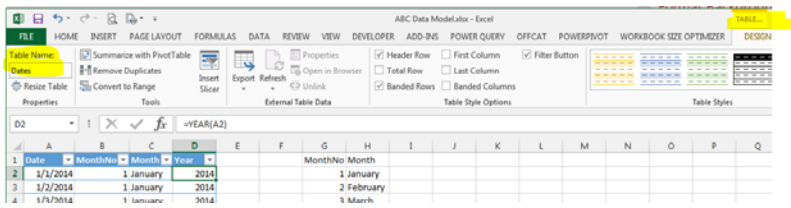
Create a Linked Dates Table

- Linked tables allow Excel data into PowerPivot model
- Create dates in Excel
- Create Excel table
  - Rename meaningfully
- Add to Data Model

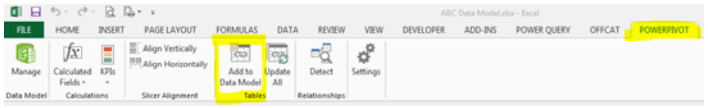


Make an Excel table

Rename the Excel table



Add the Excel table to the Data Model (PowerPivot)

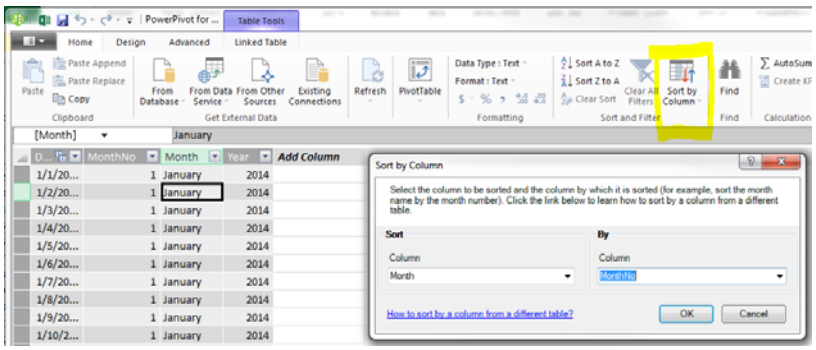


Steps

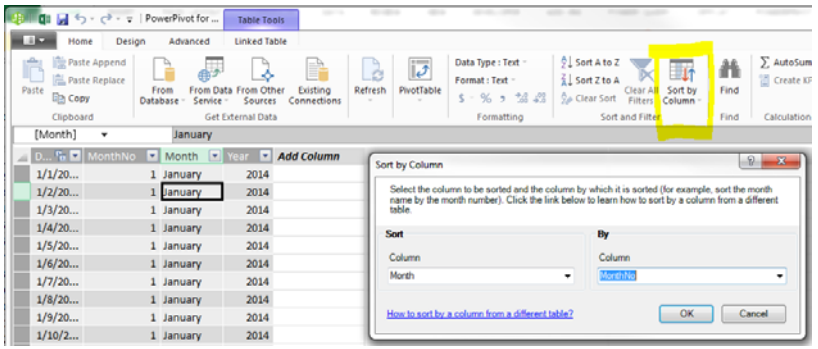
- Create dates in Excel
- Create Excel table
  - Rename meaningfully
- Add to Data Model

Do that now

Get Months in Correct Order



Do that step now



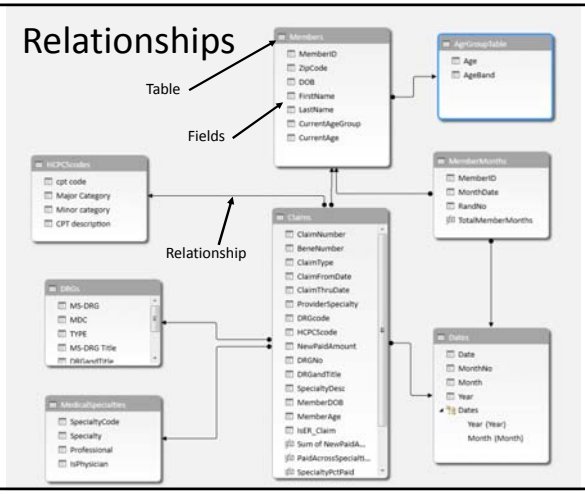
Create Date Hierarchy

- Diagram view
- Select top field
- Right-click – Create Hierarchy
- Drag fields
- Rename

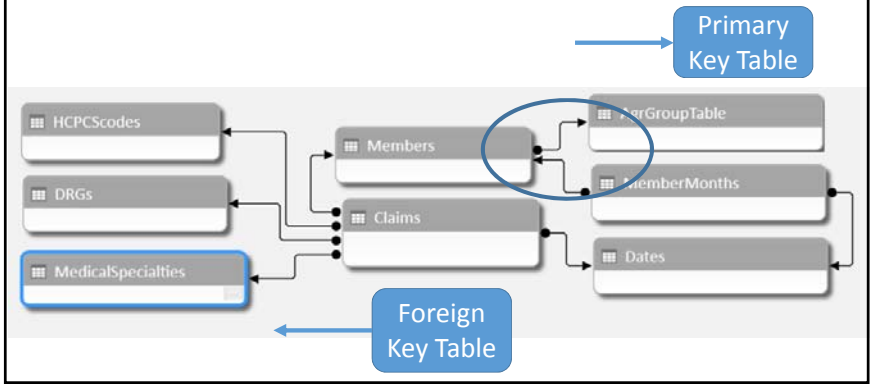
Do That Now

Relationships

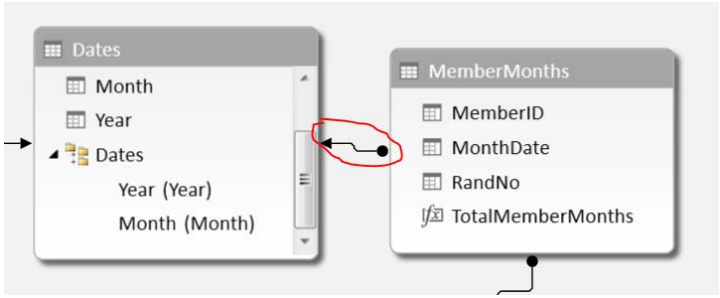
Where are?
- Fact tables
- Dimension tables



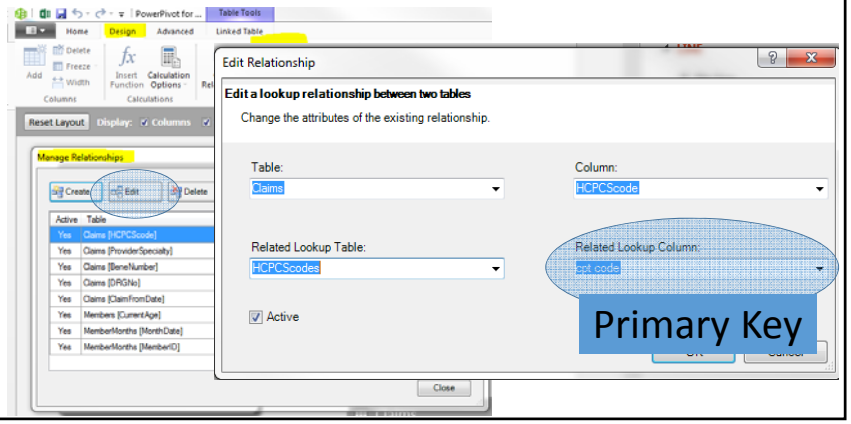
PowerPivot Relationships



Creating PowerPivot Relationships – Drag and Drop



Creating PowerPivot Relationships – Manage Relationships

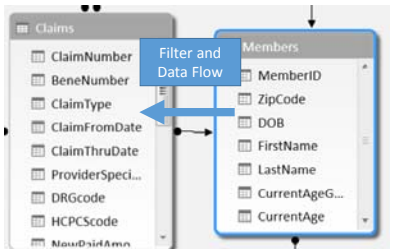


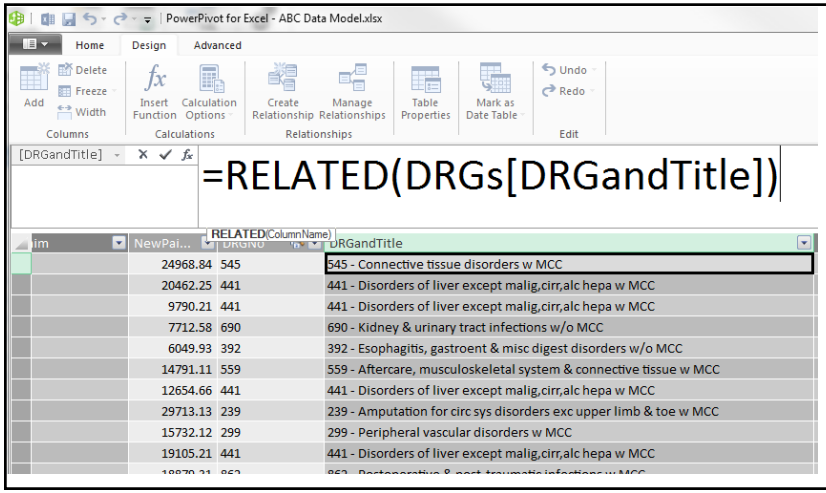
Do This Now

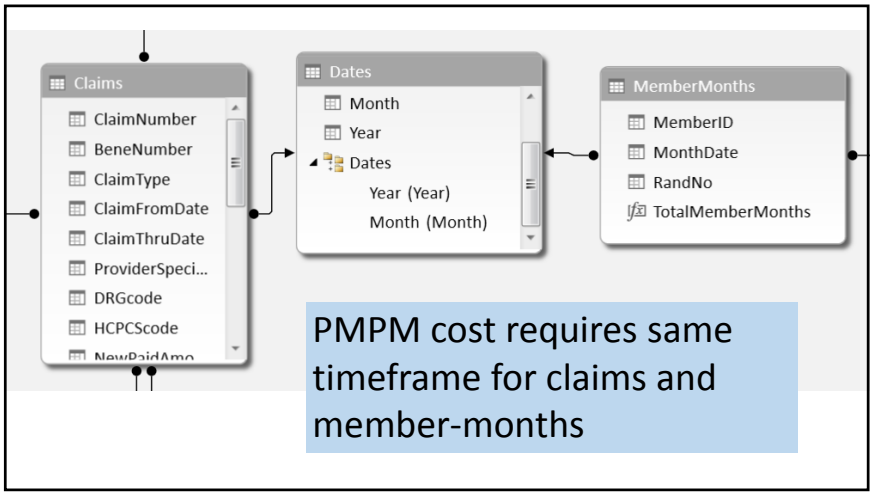
Active	Table	Related Lookup Table
Yes	Claims [HCPCScode]	HCPCScodes [cpt code]
Yes	Claims [ProviderSpecialty]	MedicalSpecialties [SpecialtyCode]
Yes	Claims [BeneNumber]	Members [MemberID]
Yes	Claims [DRGNo]	DRGs [MS-DRG]
Yes	Claims [ClaimFromDate]	Dates [Date]
Yes	Members [CurrentAge]	AgrGroupTable [Age]
Yes	MemberMonths [MonthDate]	Dates [Date]
Yes	MemberMonths [MemberID]	Members [MemberID]

How to Use PowerPivot Relationships

- Data and filters flow downhill
  - Primary key to foreign key tables
- RELATED function moves data from primary to foreign table







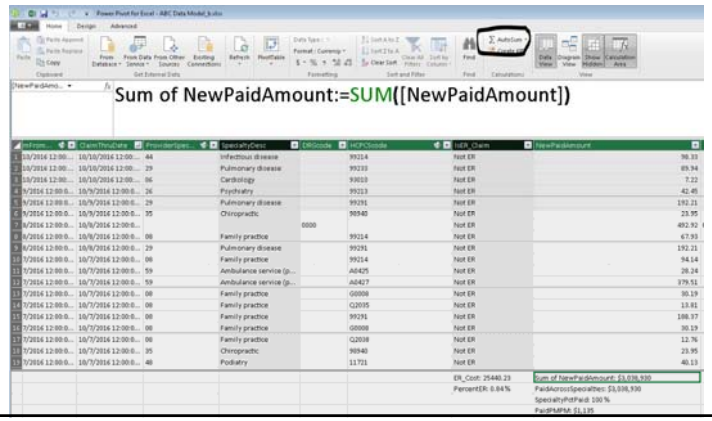
PMPM cost requires same timeframe for claims and member-months

PowerPivot Column Calculations

```
=if(left([HCPCScode],4)="9928","Is ER","Not ER")
```

	mFrom...	ClaimThruDate	ProviderSpec...	SpecialtyDesc	DRGcode	HCPCScode	IsER_Claim	NewP
1	10/2016 12:00:...	10/10/2016 12:00:...	44	Infectious disease		99214	Not ER	
2	10/2016 12:00:...	10/10/2016 12:00:...	29	Pulmonary disease		99233	Not ER	
3	10/2016 12:00:...	10/10/2016 12:00:...	06	Cardiology		93010	Not ER	
4	9/2016 12:00:0...	10/9/2016 12:00:0...	26	Psychiatry		99213	Not ER	
5	9/2016 12:00:0...	10/9/2016 12:00:0...	29	Pulmonary disease		99291	Not ER	
6	9/2016 12:00:0...	10/9/2016 12:00:0...	35	Chiropractic		98940	Not ER	
7	8/2016 12:00:0...	10/8/2016 12:00:0...			0000		Not ER	
8	8/2016 12:00:0...	10/8/2016 12:00:0...	08	Family practice		99214	Not ER	
9	8/2016 12:00:0...	10/8/2016 12:00:0...	29	Pulmonary disease		99291	Not ER	
10	7/2016 12:00:0...	10/7/2016 12:00:0...	08	Family practice		99214	Not ER	

PowerPivot Summary Calculations



PaidAcrossSpecialties:=CALCULATE(sum([NewPaidAmount]), all(Claims[SpecialtyDesc]))

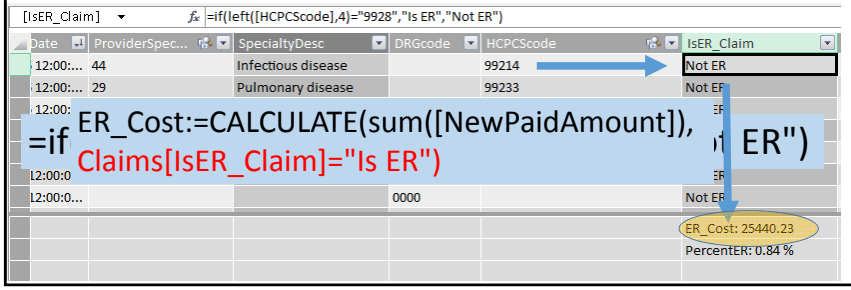
- Affect pivot table features
- Add or remove "filters" on data

Row Labels	Sum of NewPaidAmount	PaidAcrossSpecialties	SpecialtyPctPaid
Internal medicine	$84,309	$760,618	11 %
Ophthalmology	$75,872	$760,618	10 %
Ambulance service (private)	$49,727	$760,618	7 %
Family practice	$38,897	$760,618	5 %
Clinical laboratory (billing independently)	$29,110	$760,618	4 %
Psychiatry	$28,315	$760,618	4 %
Emergency medicine	$27,017	$760,618	4 %
Physical therapist (private practice)	$26,203	$760,618	3 %
Diagnostic radiology	$24,891	$760,618	3 %
Orthopedic surgery	$23,008	$760,618	3 %
Nurse practitioner	$22,248	$760,618	3 %
Cardiology	$21,559	$760,618	3 %
Podiatry	$20,475	$760,618	3 %

ClaimType
- 10-HHA
- 20-SNF (Non-swing bed)
- 30-Swing bed SNF
- 40-Outpatient
- 50-Hospice
- 60-Inpatient
- 71-Carrier Non-DME
- 72-DME

DAX Functions - Filters

- Creates a filter that isn't in the pivot table



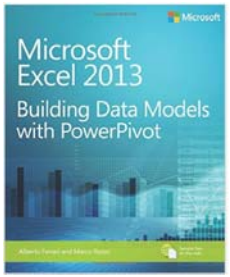
Result

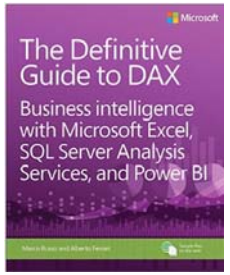
Row Labels	ER_Cost
⊞ 2014	$7,663.85
⊞ 2015	$8,443.23
⊟ 2016	$9,333.15
January	$637.08
February	$813.38
March	$900.77
April	$644.42
May	$1,094.56
June	$1,416.40
July	$1,848.21
August	$1,094.65
September	$829.82
October	$53.86
Grand Total	$25,440.23

Other Cool DAX Functions

- ALLEXCEPT – same ALL except you specify the exception fields
- LOOKUPVALUE – looks up on multiple values without relationship; use with IFERROR
- SUMMARIZE – summarizes value within or across tables
- PATH – creates a path across a sequence of records
- SWITCH – tests multiple true/false conditions
- Date functions – ENDOFMONTH, CLOSINGBALANCEMONTH, TOTALYTD, DAYSYTD, PARALLELPERIOD
- VALUES – shows a text field in the VALUES area of pivot table
- Linkback table – create an Excel summary table in DAX and link it back into the Data Model
- Plus all of the Excel functions

References





Search Amazon for PowerPivot and DAX

PowerPivot Formulas

Claims table:

Column formulas:

```
SpecialtyDesc=RELATED(MedicalSpecialties[Specialty])
IsER_Claim=if(left([HCPCScode],4)="9928","Is ER","Not ER")
DRGandTitle=RELATED(DRGs[DRGandTitle])
MemberDOB=RELATED('Members'[DOB])
MemberAge=round(([ClaimFromDate]-[MemberDOB])/365,0)
```

Summary formulas:

```
ER_Cost:=CALCULATE(sum([NewPaidAmount]),Claims[IsER_Claim]="Is ER")
PercentER:=[ER_Cost]/[Sum of NewPaidAmount]
Sum of NewPaidAmount:=SUM([NewPaidAmount])
PaidAcrossSpecialties:=CALCULATE(sum([NewPaidAmount]),all(Claims[SpecialtyDesc]))
SpecialtyPctPaid:=[Sum of NewPaidAmount]/[PaidAcrossSpecialties]
PaidPMPM:=[Sum of NewPaidAmount]/[TotalMemberMonths]
```

Members table:

Column formulas:

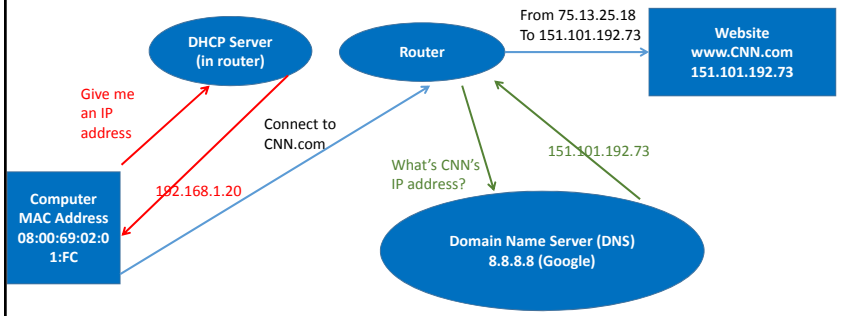
```
CurrentAgeGroup=RELATED(AgrGroupTable[AgeBand])
CurrentAge=round((TODAY()-[DOB])/365,0)
```

See PowerPivot Formulas.docx

PowerPivot Playtime

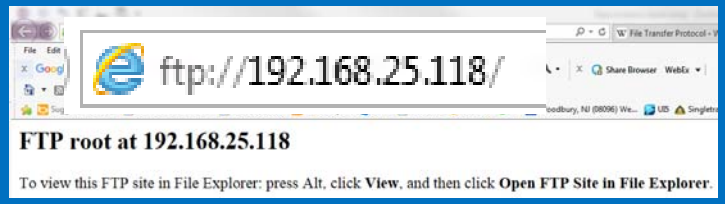
NETWORKING AND FTP/SFTP

Computer Device Addressing

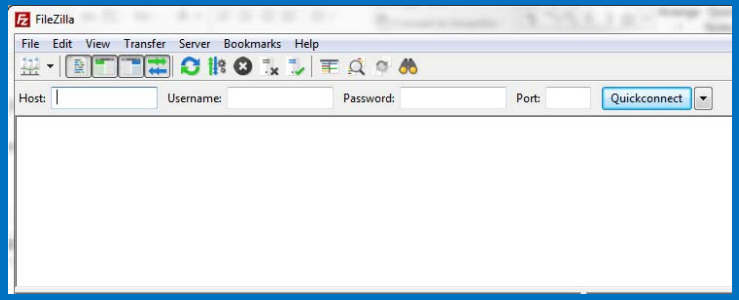


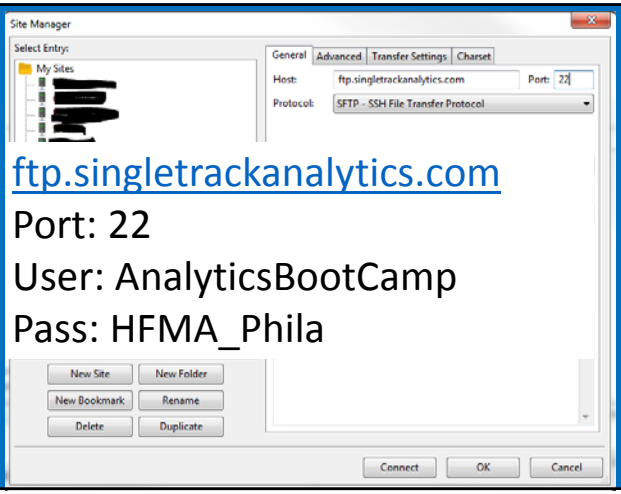
FTP and SFTP (File Transfer Protocol)

- Process to transfer files across the internet
  - FTP – unsecure, unencrypted
  - SFTP – secure, encrypted

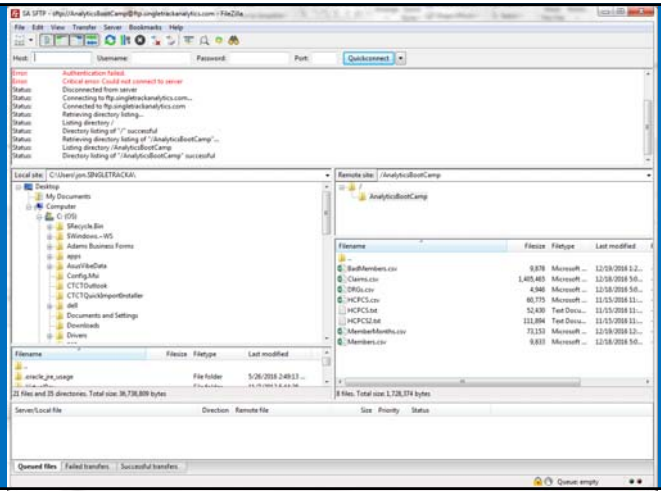


Secure FTP Using FileZilla





ftp.singletrackanalytics.com
Port: 22
User: AnalyticsBootCamp
Pass: HFMA_Phila



Thank you!

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Shan Muthersbaugh-KPMG
Mike Rossi-Penn

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Kelly Price-HANYS
Anne DelPizzo-PATHS

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Ann Saputelli-Clinton Rubin
Anne DelPizzo-PATHS

Conference Room - KPMG