Power BI Hands-On

An Introductory Guide to Data Visualization

Anita Huang
Wistron Information Technology & Services Corporation
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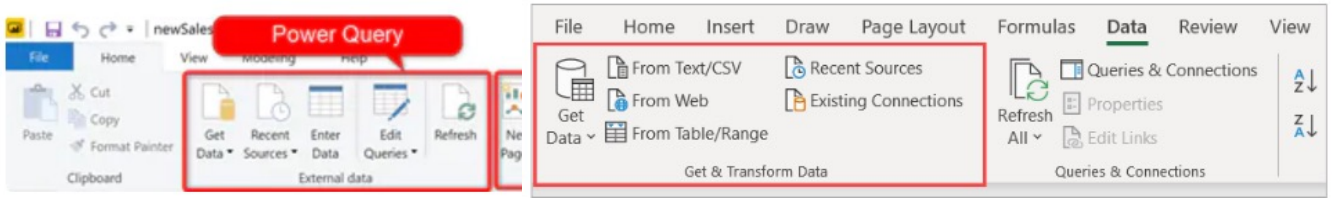
Power BI Power tools?



- Power Query: ETL tool (nice interface, record steps, write M code behind scenes, data integration/merging)
- Power Pivot: Data relationships, data model, measures (DAX code)

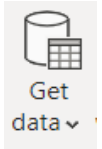
Why Power BI?

1. Bigger Scale: Compare to excel, PBI can load over 1M records.
2. Connection options: access and extract data from systems and applications.
3. Better visuals: Sophisticated, interactive (between visuals or cross reports), customized visuals
4. Dashboards and KPIs: customizable (for branding, projects), support browser and mobile UI
5. UI and UX: Either for developers or end-users, PBI provides better UI and are user-friendly
6. Alerts: schedule notification via emails
7. Automatic Update: data update automatically instead of reload.
8. Collaborative: data and report sharing

Power BI 實作

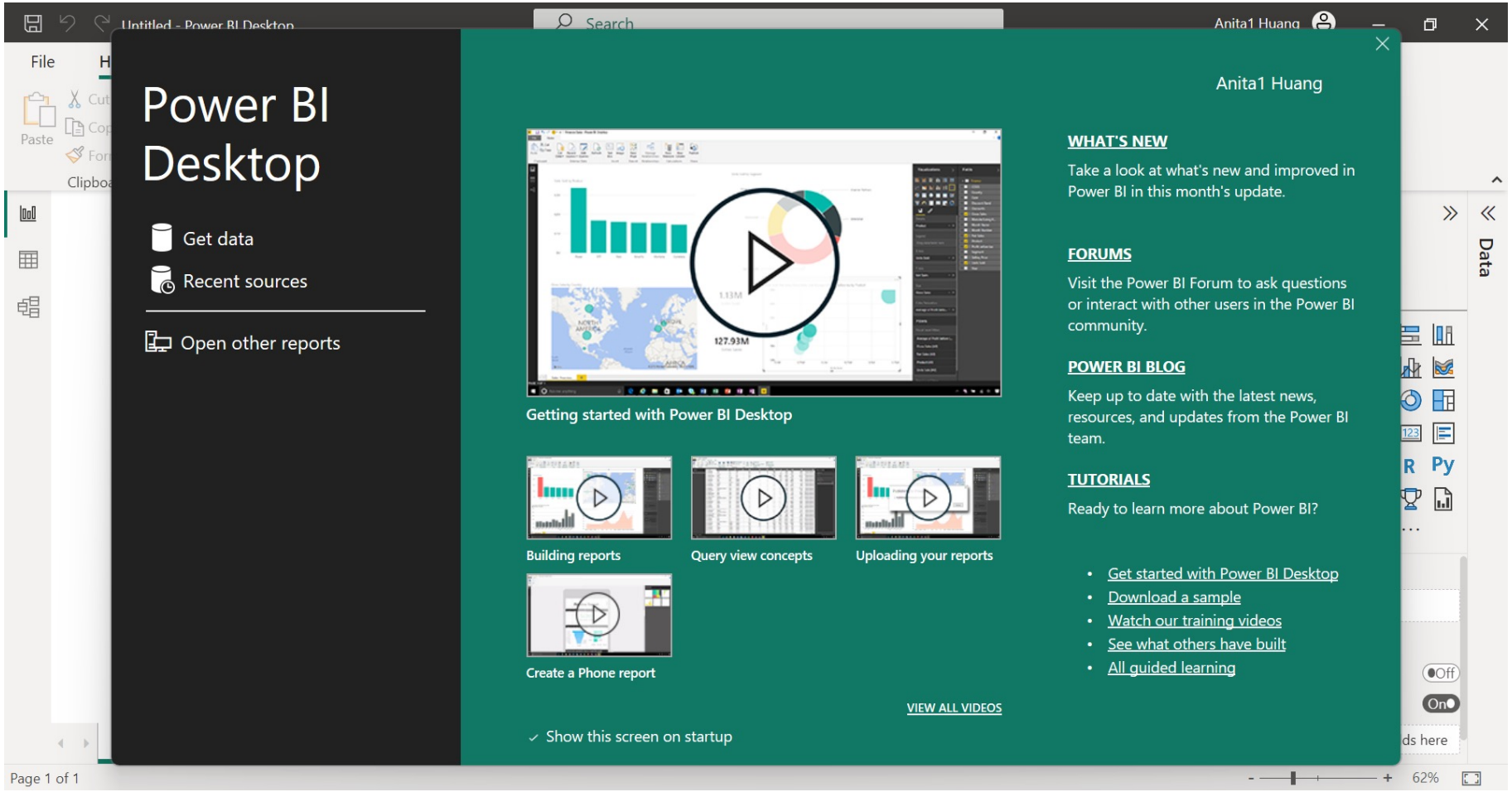
Course Outline

1. Power BI Desktop Download
2. Connect to data source [“Get data”]
   Excel, database, etc.



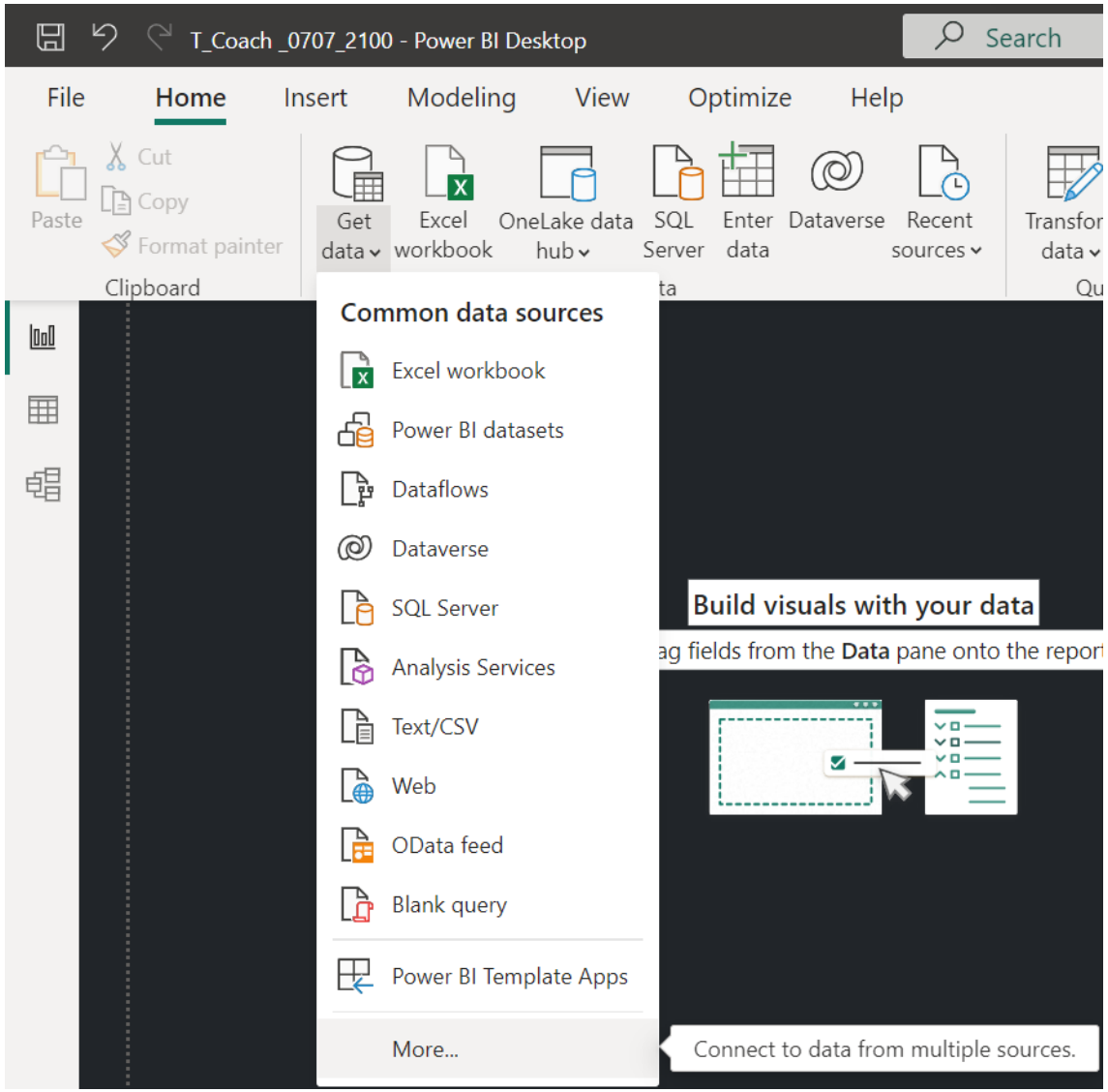
3. Data Query [Transform data ETL]
   Data types, promoted headers, change sheet name, column names, additional columns, merge etc.
4. Format Report Page
   Canvas size, insert shapes, background, wallpaper, design guideline, branding, theme colors, etc.
5. Get to know your project and data
6. Data Modeling
   Data relationships, single vs. cross-filters, category label order
7. Chart Design
   Theme gallery, cross-sectional vs. longitudinal, etc.
8. Introduction to DAX functions
9. Power BI Handy Features
   - Slicers
   - Page Navigation
   - Bookmarks

1. Power BI Desktop Download

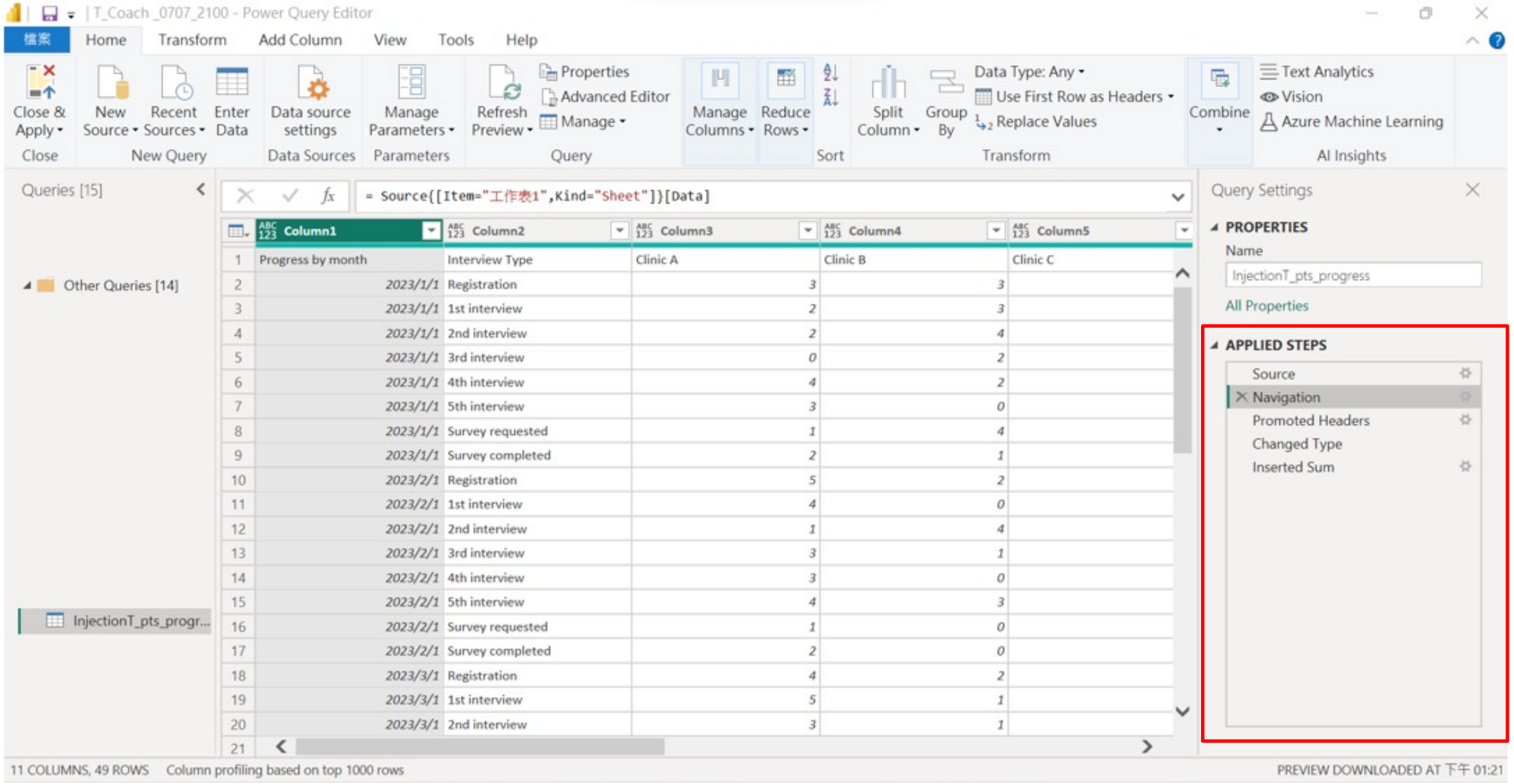


[Power BI Download Link]

2. Connect to Data Source



3. Power Edit Query



	Column1	Column2	Column3	Column4	Column5
1	Progress by month	Interview Type	Clinic A	Clinic B	Clinic C
2	2023/1/1	Registration	3	3	
3	2023/1/1	1st interview	2	3	
4	2023/1/1	2nd interview	2	4	
5	2023/1/1	3rd interview	0	2	
6	2023/1/1	4th interview	4	2	
7	2023/1/1	5th interview	3	0	
8	2023/1/1	Survey requested	1	4	
9	2023/1/1	Survey completed	2	1	
10	2023/2/1	Registration	5	2	
11	2023/2/1	1st interview	4	0	
12	2023/2/1	2nd interview	1	4	
13	2023/2/1	3rd interview	3	1	
14	2023/2/1	4th interview	3	0	
15	2023/2/1	5th interview	4	3	
16	2023/2/1	Survey requested	1	0	
17	2023/2/1	Survey completed	2	0	
18	2023/3/1	Registration	4	2	
19	2023/3/1	1st interview	5	1	
20	2023/3/1	2nd interview	3	1	
21					

4. Project Background & Data

- Company Name: FITNESS
- FITNESS Treatment Program: Injection meds
- Treatment Combines with:
  1. Checkup Interviews (by Clinics)
  2. Tracker APP (patient engagement)

5. Metrics (KPIs)

KPI: Injection treatment program- registration and patients progress

1. Number of patients register to the program each month

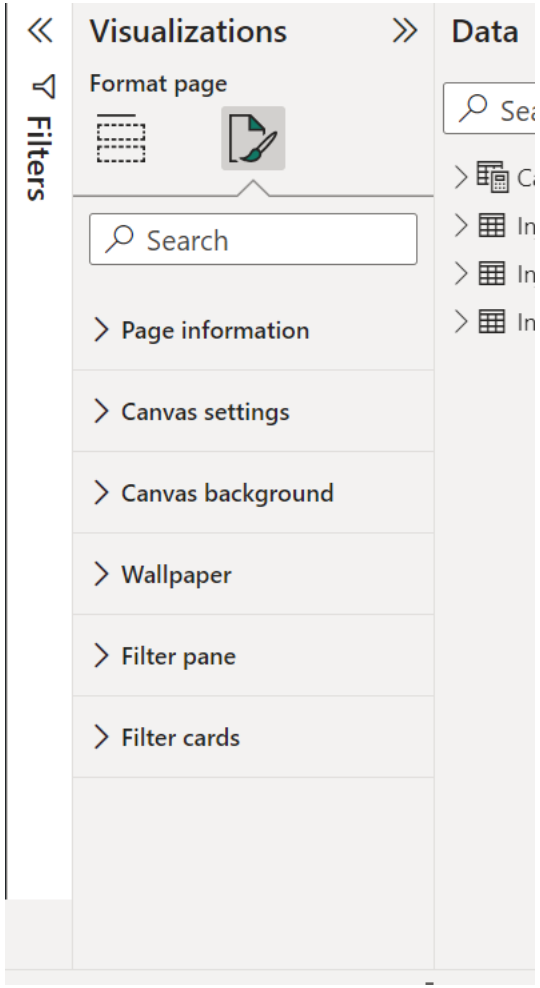
2. Cumulative number of patients register to the program over time

3. Number of patients in each interview stage by clinics

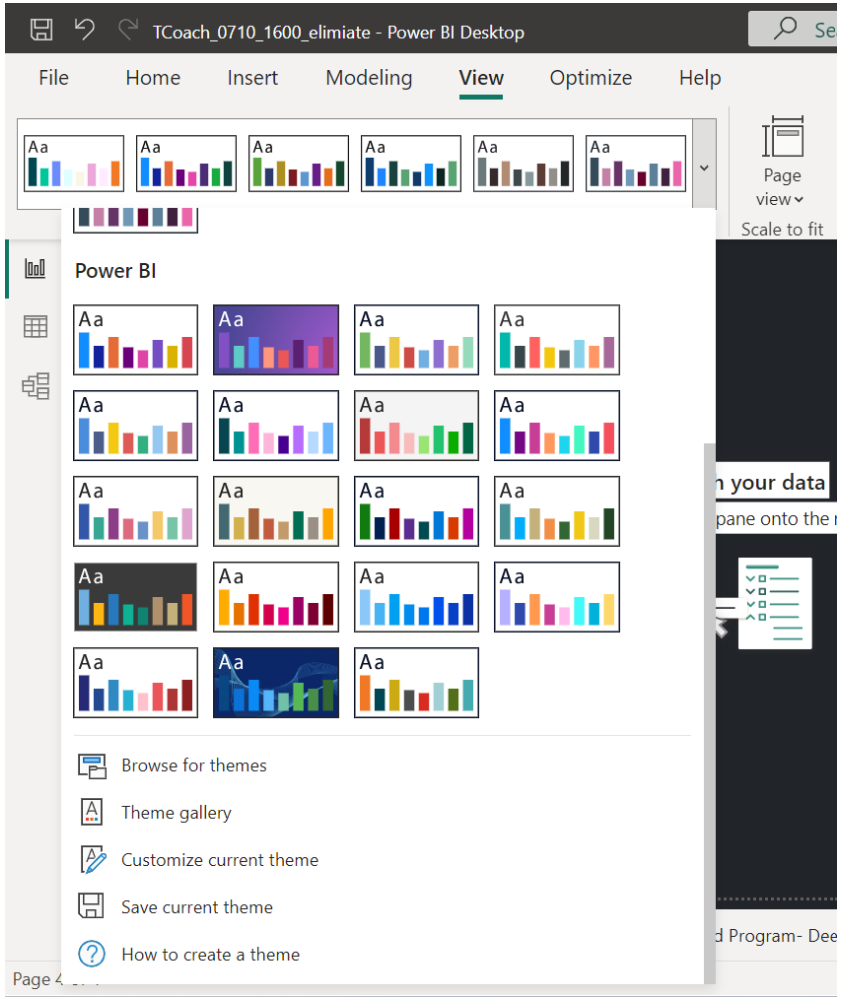
5. Format Report Page

Things to take in mind:
1. Color palette?
2. Font family?
3. Project theme?
4. End users?

Guideline: Clear



[Color Picker Website Recommend]



Supplementary References for Dashboard Design:
1. https://dataschool.com/how-to-design-a-dashboard/
2. https://dataschool.com/how-to-design-a-dashboard/introduction/

6. Power BI visual #1

KPI: Number of patients register to the program each month

Visual Type: Bar

X-axis: Month

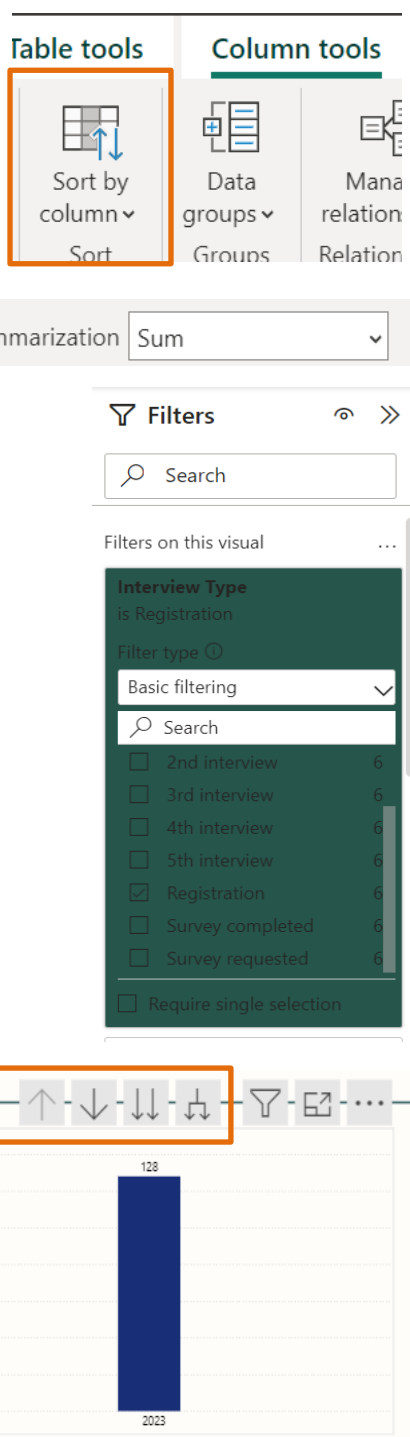
```
FORMAT('table_name'[date column], "Mmm")
```

Y-axis: Sum of the registration number of all clinic each month

```
SUM ('table_name'[Total Number])
```

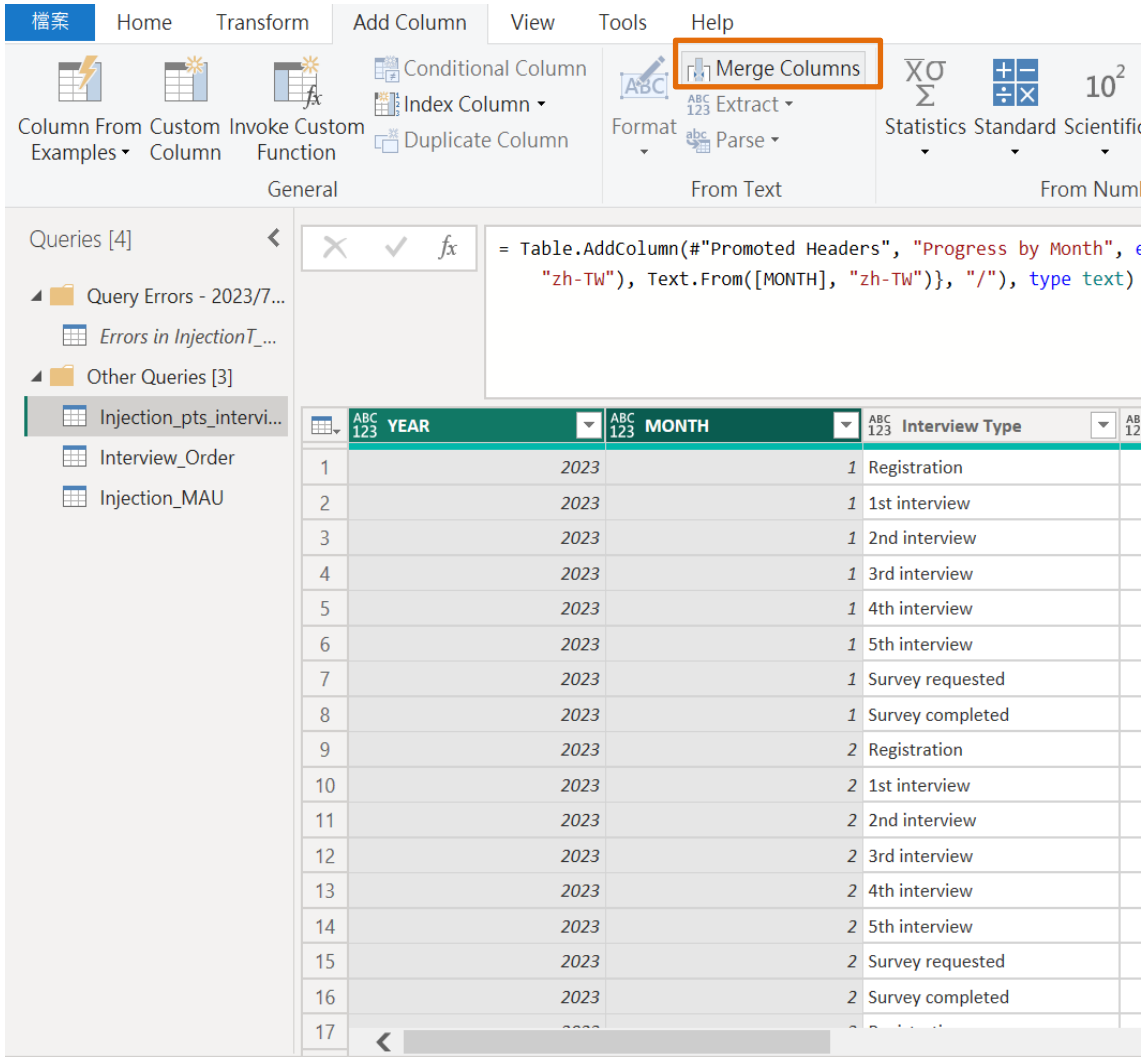
Filters on this visual: Interview Type= Registration

```
CALCULATE(
        SUM ('table_name'[Total Number]) ,
         Filter('table_name',
         'table_name'[Interview Type]=="Registration"
          )
)
```



Power Query Add calculated column

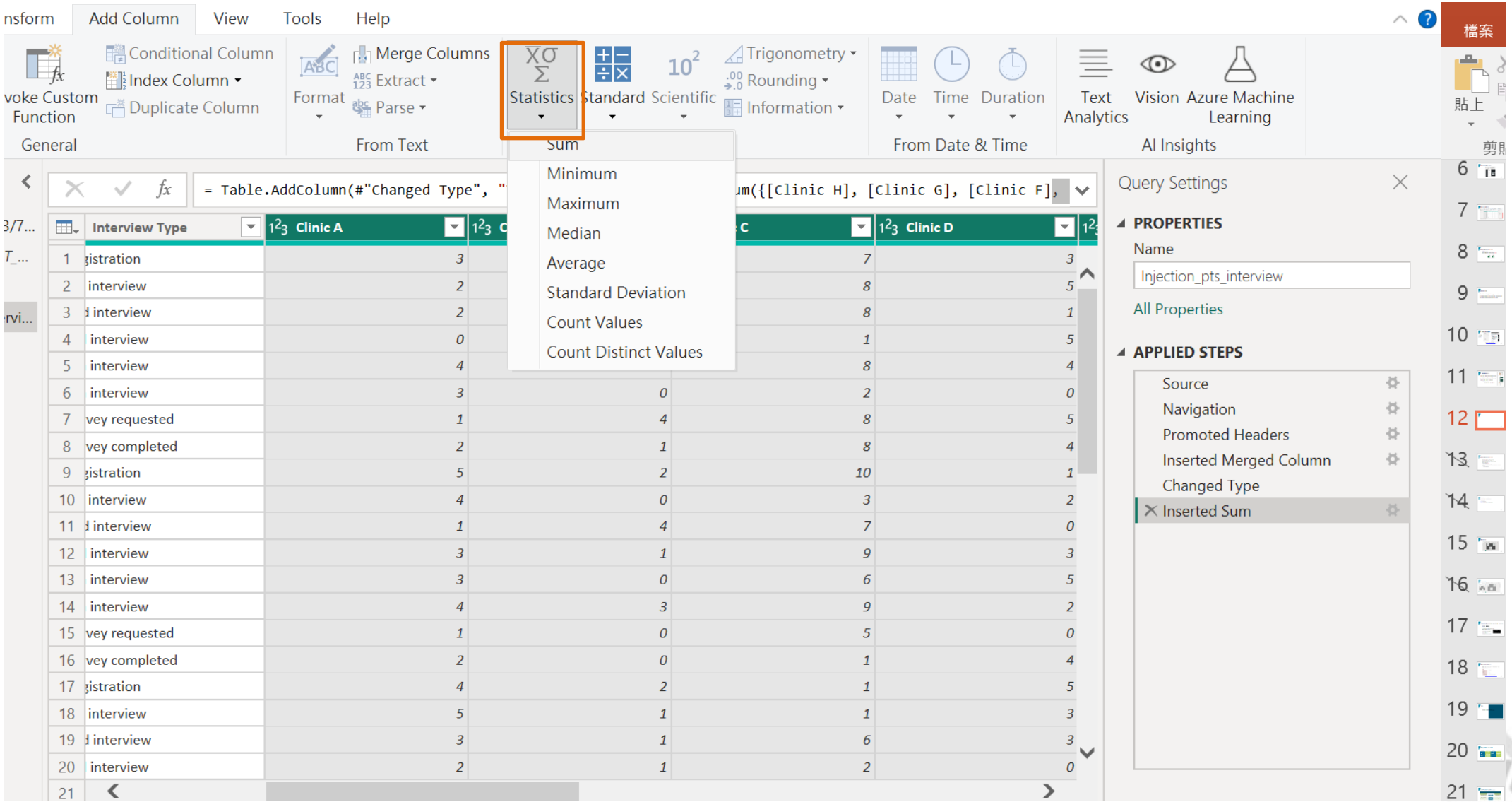
Combine Year and Month column into DATE



	YEAR	MONTH	Interview Type
1	2023	1	Registration
2	2023	1	1st interview
3	2023	1	2nd interview
4	2023	1	3rd interview
5	2023	1	4th interview
6	2023	1	5th interview
7	2023	1	Survey requested
8	2023	1	Survey completed
9	2023	2	Registration
10	2023	2	1st interview
11	2023	2	2nd interview
12	2023	2	3rd interview
13	2023	2	4th interview
14	2023	2	5th interview
15	2023	2	Survey requested
16	2023	2	Survey completed
17			

Power Query Add calculated column

Add a column that sum up the selected value each row



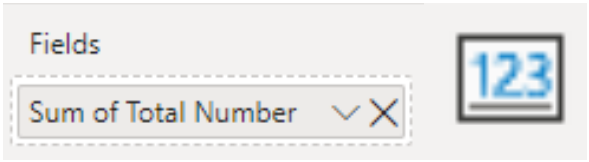
	Interview Type	Clinic A	Clinic C	Clinic D
1	gistration	3	7	3
2	interview	2	8	5
3	l interview	2	8	1
4	interview	0	1	5
5	interview	4	8	4
6	interview	3	2	0
7	vey requested	1	8	5
8	vey completed	2	8	4
9	gistration	5	10	1
10	interview	4	3	2
11	l interview	1	7	0
12	interview	3	9	3
13	interview	3	6	5
14	interview	4	9	2
15	vey requested	1	5	0
16	vey completed	2	1	4
17	gistration	4	1	5
18	interview	5	1	3
19	l interview	3	6	3
20	interview	2	2	0
21				

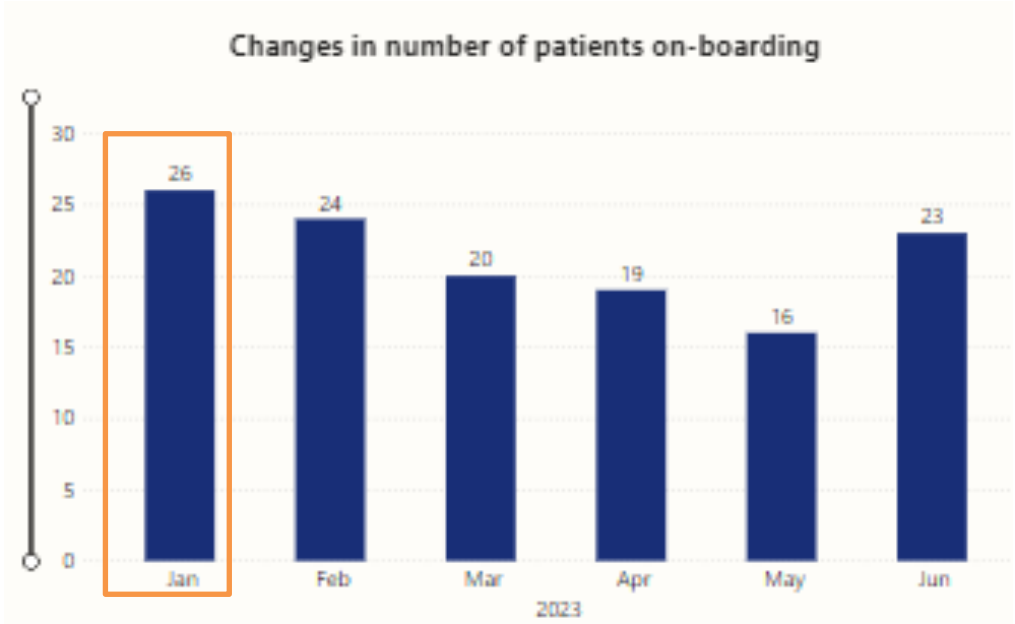
What is Measure?

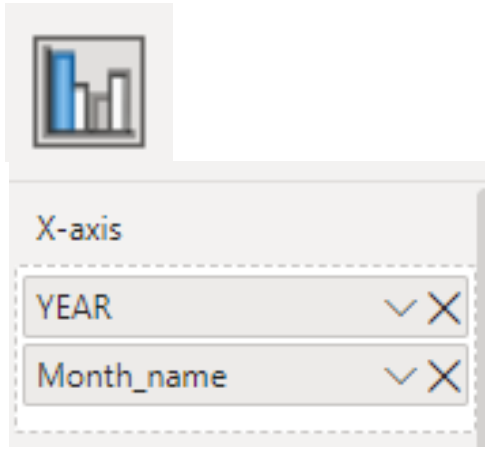
- A calculation/ an aggregation
- Useful in the context of visuals
- Dynamically respond to user interactions and selections.
- Provide interactive results on visuals based on the data or filters applied
- Actively adjusts and recalculates the totals based on the active filter

```
CALCULATE(
        SUM ('table_name'[Total Number]) ,
1.      Filter('table_name',
2.      'table_name'[Interview Type]=="Registration"
        )
)
```

Initial Condition: February 2023







```
CALCULATE(
        SUM ('table name'[Total Number]) ,
1.      Filter('table name',
2.      'table name'[Interview Type]=="Registration"
         )
)
```

Condition 1

	A	B	C	D	E	F	G	H	I	J	K	L
1	YEAR	MONT	Interview Type	Clinic A	Clinic B	Clinic C	Clinic D	Clinic E	Clinic F	Clinic G	Clinic H	Total Number
10	2023	2	Registration	5	2	10	1	0	4	1	1	24
11	2023	2	1st interview	4	0	3	2	0	1	2	1	13
12	2023	2	2nd interview	1	4	7	0	2	0	2	2	18
13	2023	2	3rd interview	3	1	9	3	3	1	2	2	24
14	2023	2	4th interview	3	0	6	5	0	7	1	1	23
15	2023	2	5th interview	4	3	9	2	3	4	1	2	28
16	2023	2	Survey requested	1	0	5	0	3	8	0	1	18
17	2023	2	Survey completed	2	0	1	4	3	6	2	2	20
50												

```
CALCULATE(
        SUM ('table name'[Total Number]) ,
1.      Filter('table name',
2.      'table name'[Interview Type]=="Registration"
        )
)
```

Condition 2

	A	B	C	D	E	F	G	H	I	J	K	L
1	YEAR	MONT	Interview Type	Clinic A	Clinic B	Clinic C	Clinic D	Clinic E	Clinic F	Clinic G	Clinic H	Total Number
10	2023	2	Registration	5	2	10	1	0	4	1	1	24
50												
51												

Your turn- Exercise

Please visualize below metric:

1. Number of patients in 1st interview each month

6. Power BI visual #2

KPI: Cumulative number of patients register to the program over time

X-axis: Month

```
FORMAT('table_name'[date column], "Mmm")
```

Y-axis: Sum of the registration number of all clinic each month

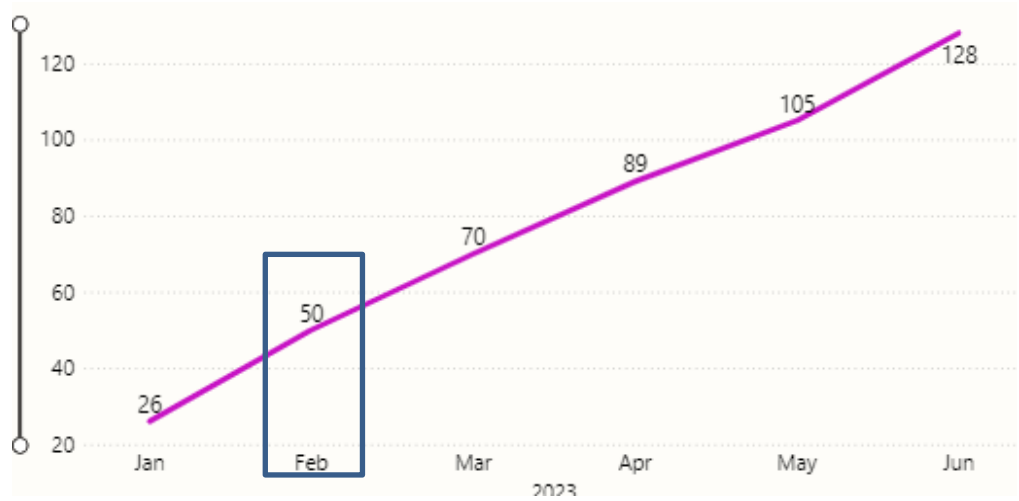
```
SUM ('table_name'[Total Number])
```

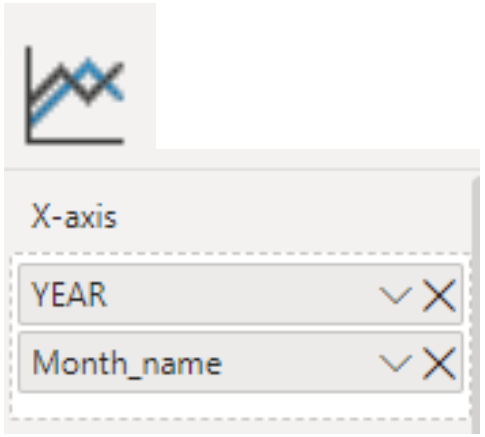
Filters on this visual: Interview Type= Registration & cumulate to the max month

```
CALCULATE(
    SUM('table_name'[Total Number]),
    FILTER (
    ALL('table_name'),
    'table_name'[Interview Type]=="Registration" &&
    'table_name'[Progress by month] <= MAX('table_name'[Progress by month])
        )
)
```

```
CALCULATE(
    SUM('table_name'[Total Number]),
    FILTER (
1.  ALL('table_name'),
2.  'table_name'[Interview Type]=="Registration" &&
3.  'table_name'[Progress by month] <= MAX('table_name'[Progress by month])
        )
)
```

~~Initial Condition: February 2023~~





```
CALCULATE(
    SUM('table_name'[Total Number]),
    FILTER (
1.  ALL('table_name'),
2.  'table_name'[Interview Type]=="Registration" &&
3.  'table_name'[Progress by month] <= MAX('table_name'[Progress by month])
        )
)
```

Condition 1

ALL function:

Removes any existing filters on the table

	A	B	C	D	E	F	G	H	I	J	K	L
1	YEAR	MONT	Interview Type	Clinic A	Clinic B	Clinic C	Clinic D	Clinic E	Clinic F	Clinic G	Clinic H	Total Number
2	2023	1	Registration	3	3	7	3	1	6	1	2	26
3	2023	1	1st interview	2	3	8	5	1	1	0	2	22
4	2023	1	2nd interview	2	4	8	1	3	3	2	1	24
5	2023	1	3rd interview	0	2	1	5	0	8	1	2	19
6	2023	1	4th interview	4	2	8	4	0	4	1	2	25
7	2023	1	5th interview	3	0	2	0	4	4	1	2	16
8	2023	1	Survey requested	1	4	8	5	1	5	2	2	28
9	2023	1	Survey completed	2	1	8	4	1	1	0	2	19
10	2023	2	Registration	5	2	10	1	0	4	1	1	24
11	2023	2	1st interview	4	0	3	2	0	1	2	1	13
12	2023	2	2nd interview	1	4	7	0	2	0	2	2	18
13	2023	2	3rd interview	3	1	9	3	3	1	2	2	24
14	2023	2	4th interview	3	0	6	5	0	7	1	1	23
15	2023	2	5th interview	4	3	9	2	3	4	1	2	28
16	2023	2	Survey requested	1	0	5	0	3	8	0	1	18
17	2023	2	Survey completed	2	0	1	4	3	6	2	2	20
18	2023	3	Registration	4	2	1	5	2	2	2	2	20
19	2023	3	1st interview	5	1	1	3	2	7	1	2	22
20	2023	3	2nd interview	3	1	6	3	3	2	2	1	21
21	2023	3	3rd interview	2	1	2	0	3	6	1	1	16
22	2023	3	4th interview	4	1	5	1	3	4	1	2	21

```
CALCULATE(
    SUM('table_name'[Total Number]),
    FILTER (
1.  ALL('table_name'),
2.  'table_name'[Interview Type]=="Registration" &&
3.  'table_name'[Progress by month] <= MAX('table_name'[Progress by month])
        )
)
```

Condition 2

	A	B	C	D	E	F	G	H	I	J	K	L
1	YEAR	MONT	Interview Type	Clinic A	Clinic B	Clinic C	Clinic D	Clinic E	Clinic F	Clinic G	Clinic H	Total Number
2	2023	1	Registration	3	3	7	3	1	6	1	2	26
10	2023	2	Registration	5	2	10	1	0	4	1	1	24
18	2023	3	Registration	4	2	1	5	2	2	2	2	20
26	2023	4	Registration	5	3	6	2	0	2	0	1	19
34	2023	5	Registration	5	0	0	5	3	1	1	1	16
42	2023	6	Registration	1	4	10	2	4	0	1	1	23
50												

```
CALCULATE(
    SUM('table_name'[Total Number]),
    FILTER (
1.  ALL('table_name'),
2.  'table_name'[Interview Type]=="Registration" &&
3.  'table_name'[Progress by month] <= MAX('table_name'[Progress by month])
        )
)
```

Condition 3

	A	B	C	D	E	F	G	H	I	J	K	L
1	YEAR	MONT	Interview Type	Clinic A	Clinic B	Clinic C	Clinic D	Clinic E	Clinic F	Clinic G	Clinic H	Total Number
2	2023	1	Registration	3	3	7	3	1	6	1	2	26
10	2023	2	Registration	5	2	10	1	0	4	1	1	24
50												

All: (when filtering) removes any existing filters on the table

<=: less than or equal to the maximum progress by month

Your turn- Exercise

Please draw below two charts:

1. Number of patients completed survey each month

2. Cumulative number of patients completed survey over time

(3. Please make it into a combo chart)

6. Power BI visual #3

KPI: Number of patients in each interview stage by clinics

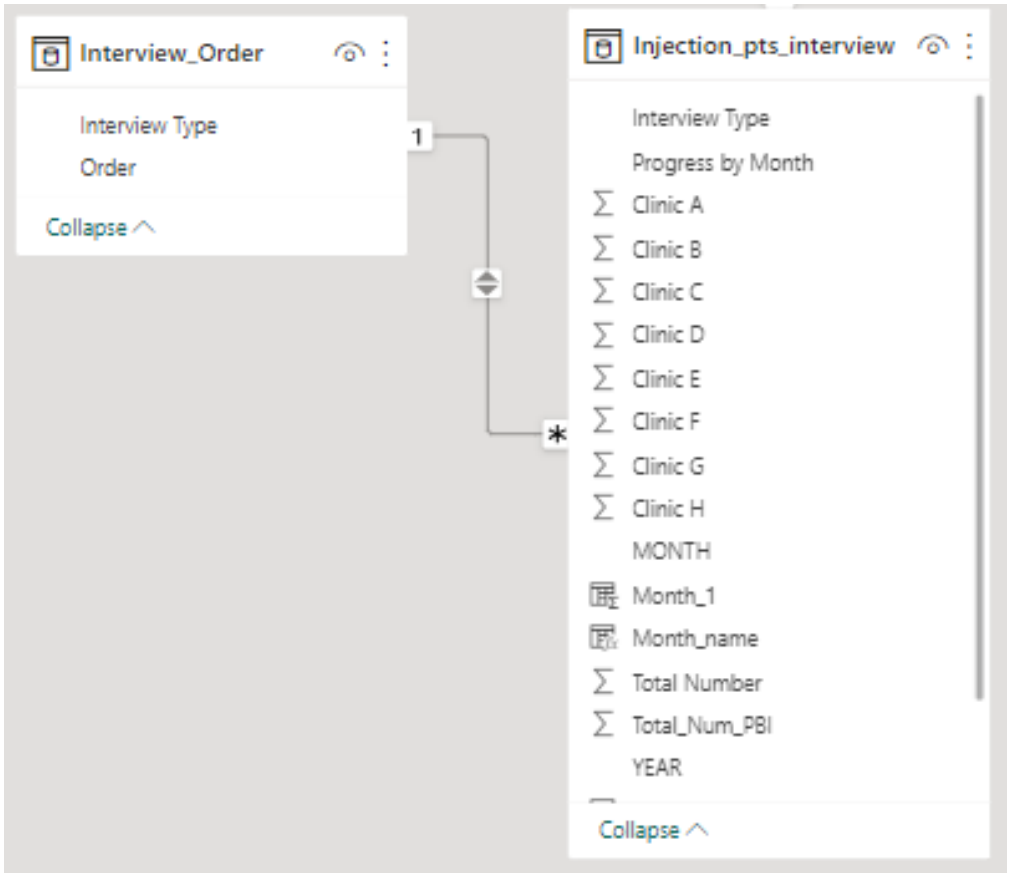
X-axis: Each interview progress stage

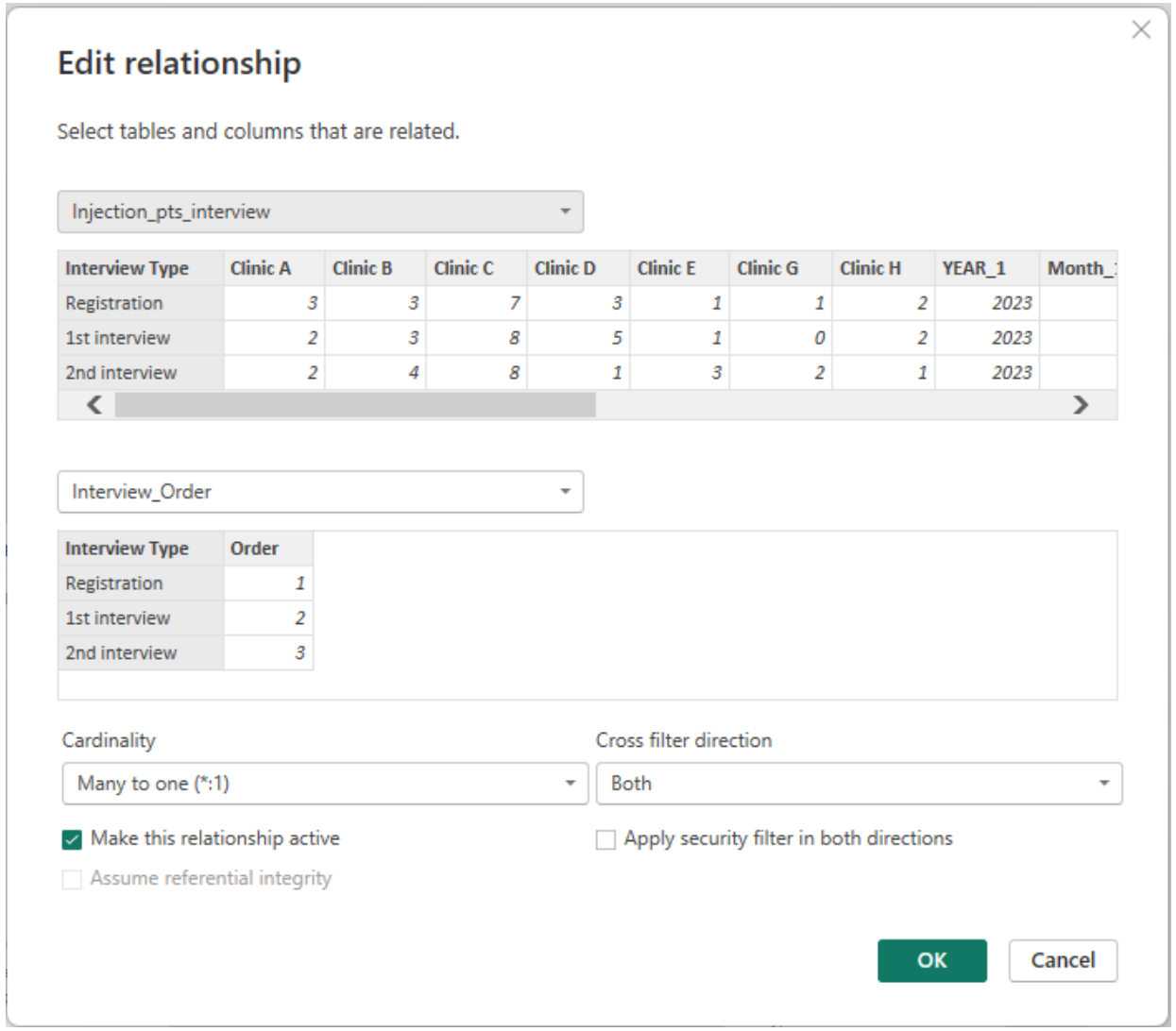
Registration->1st interview-> 2nd interview->3rd interview-> 4th interview -> 5th interview-> survey requests-> survey completed

Y-axis: Number of patients by clinics

Sum each clinic's patient number across all month

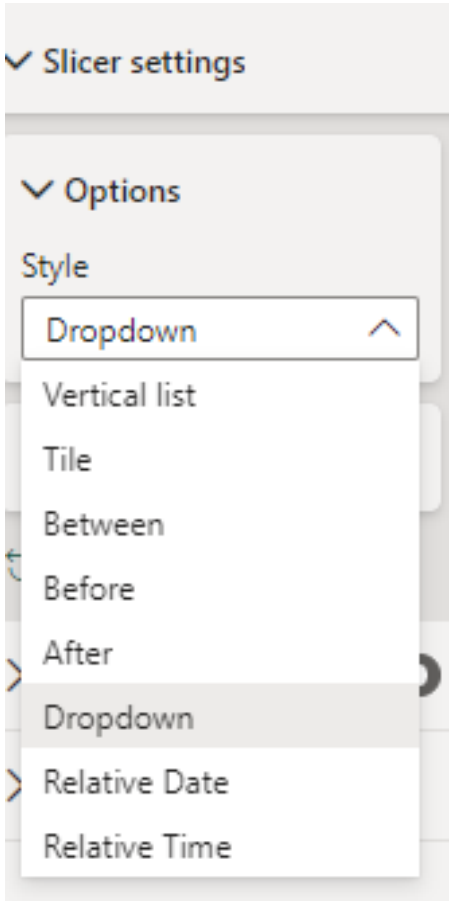
5. Data Model

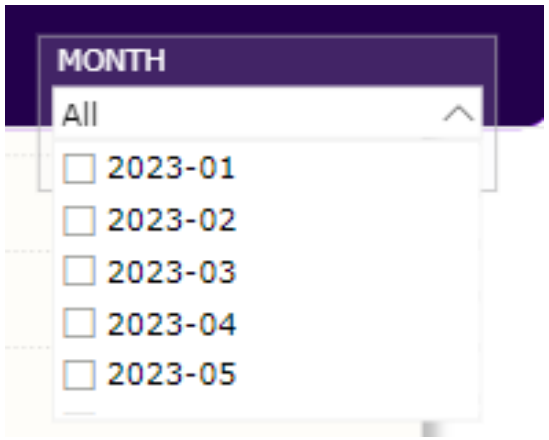

Interview_Order
Interview Type
Order
Collapse
1
*
Injection_pts_interview
Interview Type
Progress by Month
Clinic A
Clinic B
Clinic C
Clinic D
Clinic E
Clinic F
Clinic G
Clinic H
MONTH
Month_1
Month_name
Total Number
Total_Num_PBI
YEAR
Collapse

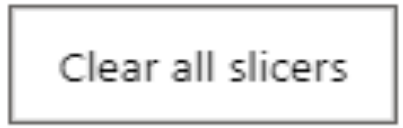

Edit relationship
Select tables and columns that are related.
Injection_pts_interview
Interview Type | Clinic A | Clinic B | Clinic C | Clinic D | Clinic E | Clinic G | Clinic H | YEAR_1 | Month_
Registration | 3 | 3 | 7 | 3 | 1 | 1 | 2 | 2023
1st interview | 2 | 3 | 8 | 5 | 1 | 0 | 2 | 2023
2nd interview | 2 | 4 | 8 | 1 | 3 | 2 | 1 | 2023
Interview_Order
Interview Type | Order
Registration | 1
1st interview | 2
2nd interview | 3
Cardinality
Many to one (*:1)
Cross filter direction
Both
Make this relationship active
Apply security filter in both directions
Assume referential integrity
OK
Cancel

6. Power BI visual-slicers and buttons

Click to filter tables based on your variable selected

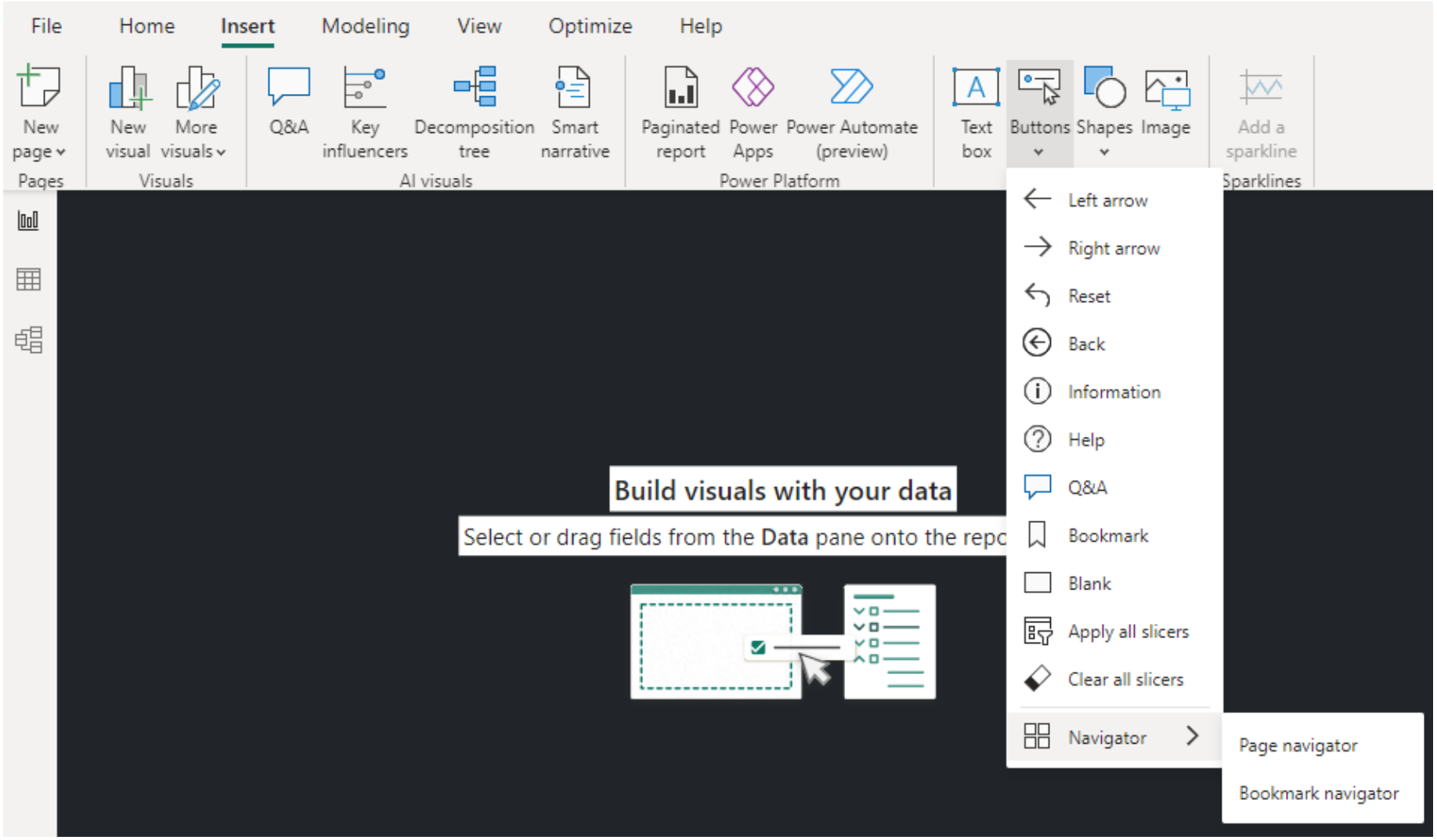


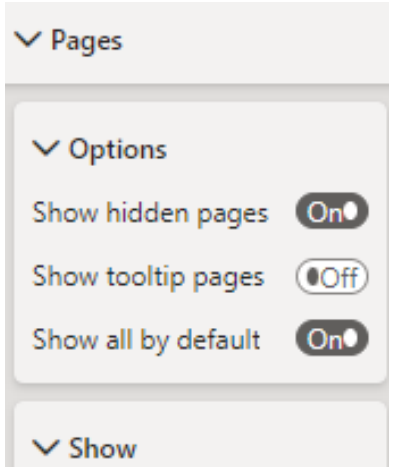




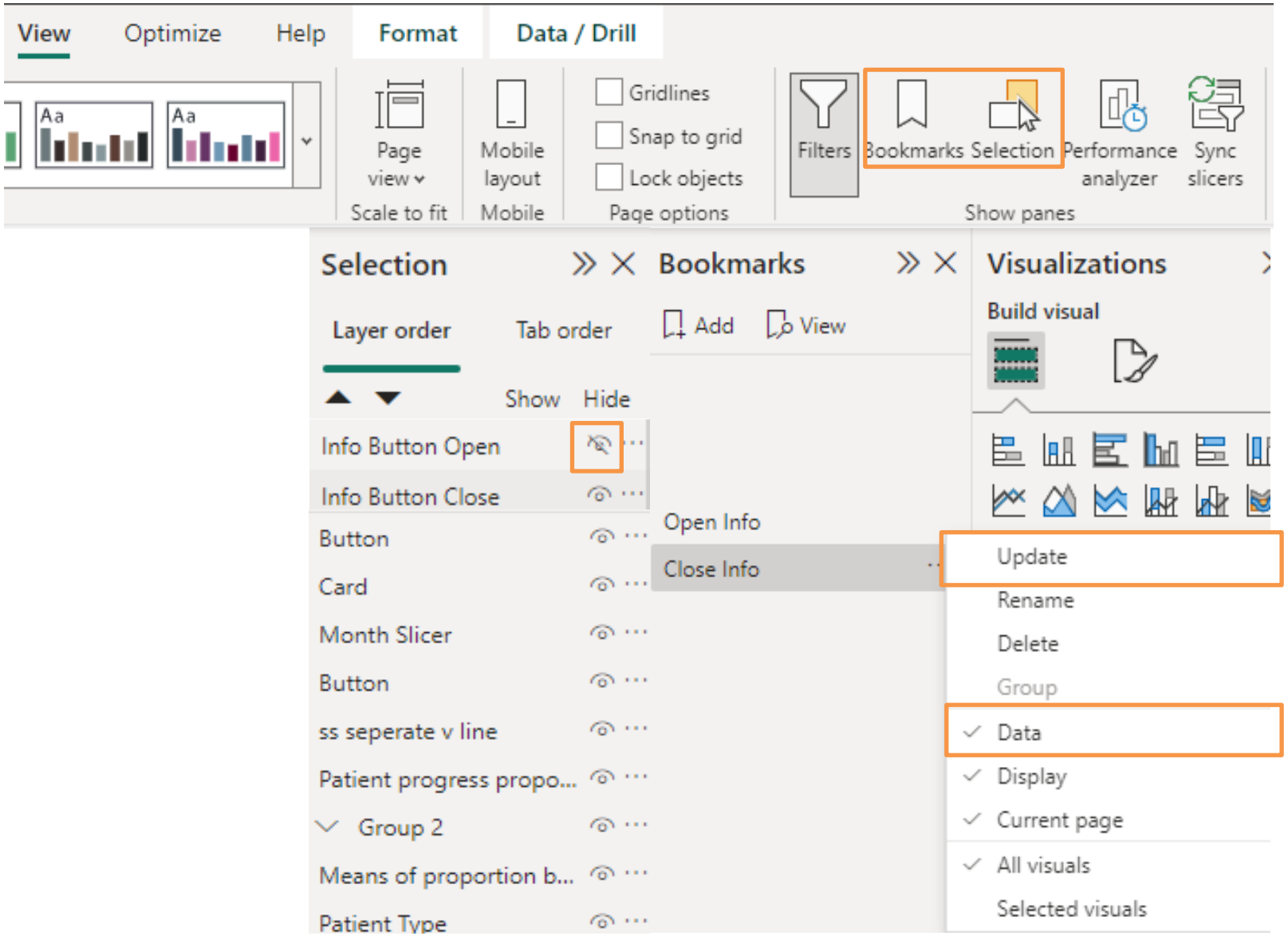
Recommended link: ICON Download

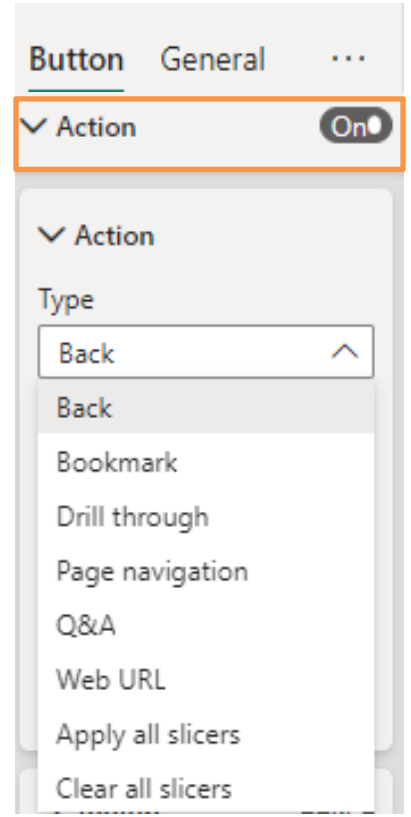
7. Navigations and Bookmarks





8. Buttons, Selections, and Bookmarks





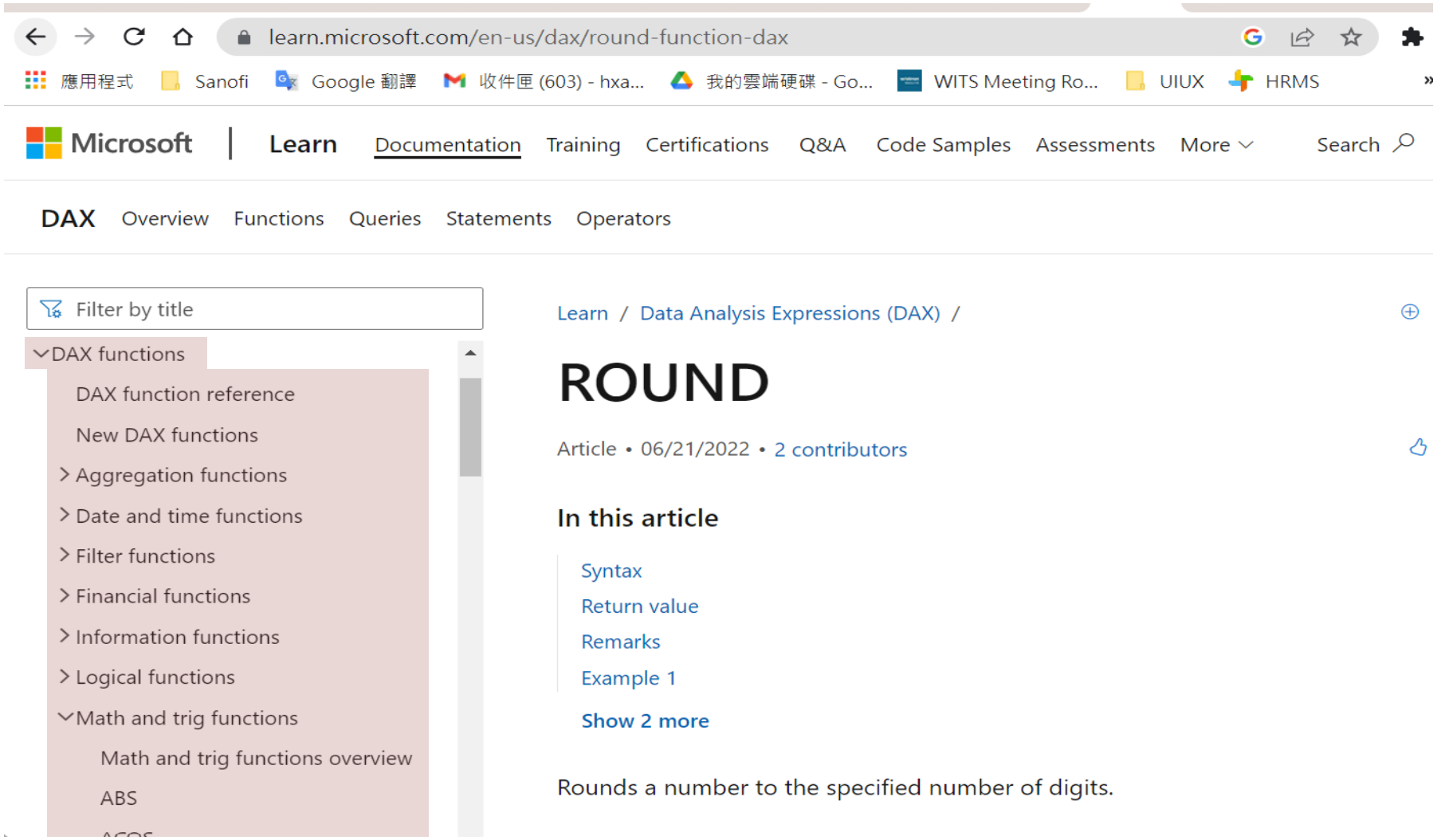
Simple DAX(Data Analysis Expressions) Functions

1. DIVIDE(<number>, <number>)
   Ex. DIVIDE(88,100)
2. ROUND (<number>, 第幾幾位小數點)
   Ex. ROUND(數值,2)
3. SUM('TABLE name' [Column Name])
4. CALCULATE (expression, <filter1>, <filter2>…)
   Ex. CALCULATE(SUM(Sales[Sales Amount]), 'Product'[Color] = "Blue")
5. IF(<logical_test>, <if_true>[, <if_false>])
   Ex. IF(A>0, "+", "-")
6. CONCATENATE (<text1>, <text2>)
   Ex. CONCATENATE("±", Round(SUM(11.8/100]),2)
   → Joins two text strings into one text string
7. & Function
   Ex. "+" & SUM(11/100) & "%"
   → Joins two text strings into one text string
8. Emoji

```
-- Using CONCATENATE function
Result = CONCATENATE("Hello", " ", "World")
-- Output: "Hello World"

-- Using & operator
Result = "Hello" & " " & "World"
-- Output: "Hello World"
```

DAX Functions Reference



https://learn.microsoft.com/en-us/dax/dax-function-reference

Metrics (KPIs)

KPI: Tracker APP- Patient Engagement Analysis (Monthly)

1. Monthly active user (MAU) rate
2. Differences in MAU compare to last month
3. The proportion of each user types monthly

   User Types: active user, non-active user, potential user, completed user

Engagement Data and Data Model

Patient Type Table

	A	B	C	D
1	Patient Type	type	legend order	type_parent
2	Active pts (MAU)	1	4	In program pts
3	Non-active pts	2	5	In program pts
4	Potential pts	3	1	Potential pts
5	Completed pts	4	2	Completed pts
6	In program pts	5	3	

MAU_Pt_Types | Injection_MAU | Eng_allTypes

Active Engagement User Rate

Recorded_Date	MAU	active_std	MAU_Diff
2023/1/1	0.243909	11.959494	null
2023/2/1	0.373397	8.706228	0.129488
2023/3/1	0.352972	10.676804	-0.020425
2023/4/1	0.507393	2.766243	0.154421
2023/5/1	0.585072	6.85418	0.077679
2023/6/1	0.525058	9.881948	-0.060014

MAU_Pt_Types | Injection_MAU | Eng_allTypes

All User Types Engagement Rate

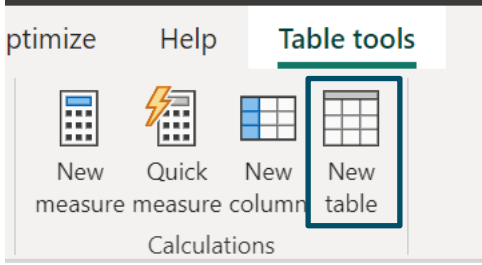
Recorded_Date	type	percentage_mean
2023/1/1	1	0.243909
2023/2/1	1	0.373397
2023/3/1	1	0.352972
2023/4/1	1	0.507393
2023/5/1	1	0.585072
2023/6/1	1	0.525058
2023/1/1	2	0.21522
2023/2/1	2	0.22111
2023/3/1	2	0.31264
2023/4/1	2	0.20132
2023/5/1	2	0.1343
2023/6/1	2	0.26539
2023/1/1	3	0.43404
2023/2/1	3	0.225723
2023/3/1	3	0.152715
2023/4/1	3	0.103861
2023/5/1	3	0.022018
2023/6/1	3	0.013404
2023/1/1	4	0.106831
2023/2/1	4	0.17977
2023/3/1	4	0.181673

MAU_Pt_Types | Injection_MAU | Eng_allTypes

Data Model


Interview_Order
Interview Type
Order
Collapse
1
*
Injection_pts_interview
Interview Type
Progress by Month
Clinic A
Clinic B
Clinic C
Clinic D
Clinic E
Clinic F
Clinic G
Clinic H
MONTH
Month_1
Month_name
Total Number
Total_Num_PBI
YEAR
Collapse
Injection_MAU
Recorded_Date
active_std
MAU
MAU_Diff
Emoji_MAU_Diff
Emoji_TAR
MAU_DIFF_Format
Std_active_Format
Collapse
*
Eng_allTypes
Recorded_Date
type
percentage_mean
Try_inprogram
Collapse
*
1
MAU_Pt_Types
type
legend order
Patient Type
Collapse

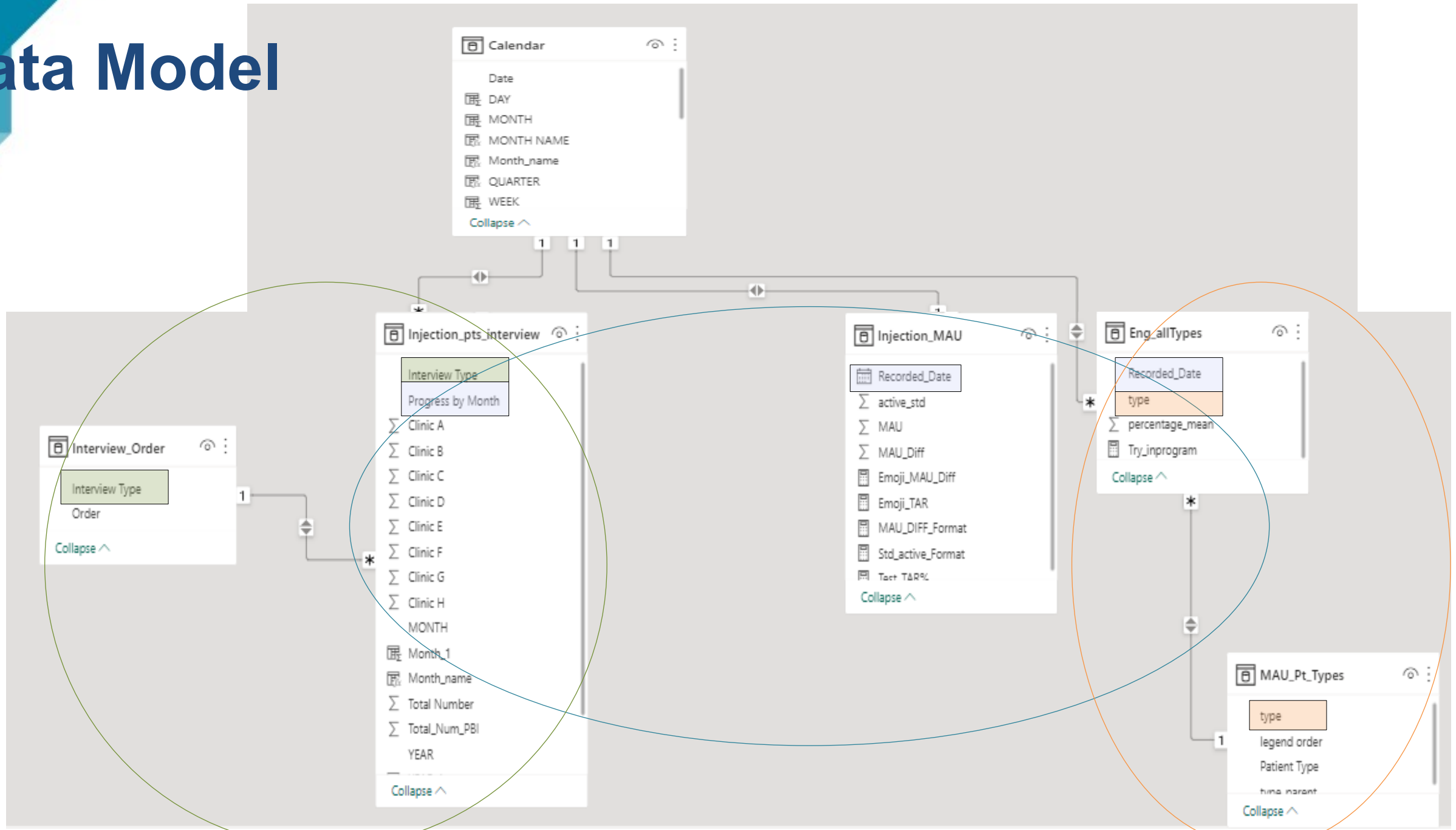
Data Model



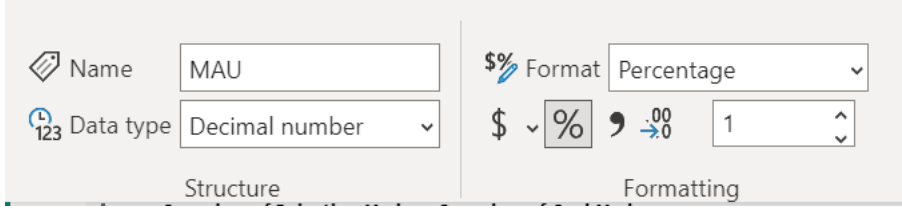
- Create a calendar table in PBI to connect all date data for date slicers

```
Calendar =
CALENDAR(DATE(2023,1,1),DATE(2023,12,31))
```

Data Model


Calendar
Date
DAY
MONTH
MONTH NAME
Month_name
QUARTER
WEEK
Collapse
Injection_pts_interview
Interview Type
Progress by Month
Clinic A
Clinic B
Clinic C
Clinic D
Clinic E
Clinic F
Clinic G
Clinic H
MONTH
Month_1
Month_name
Total Number
Total_Num_PBI
YEAR
Collapse
Injection_MAU
Recorded_Date
active_std
MAU
MAU_Diff
Emoji_MAU_Diff
Emoji_TAR
MAU_DIFF_Format
Std_active_Format
Collapse
Eng_allTypes
Recorded_Date
type
percentage_mean
Try_inprogram
Collapse
Interview_Order
Interview Type
Order
Collapse
MAU_Pt_Types
type
legend order
Patient Type
Collapse

Power BI visual #4, #5



KPI: Monthly active user (MAU) rate

1. Visual Type: Card
   Field: MAU of each month

```
SUM ('table_name'[MAU])
```

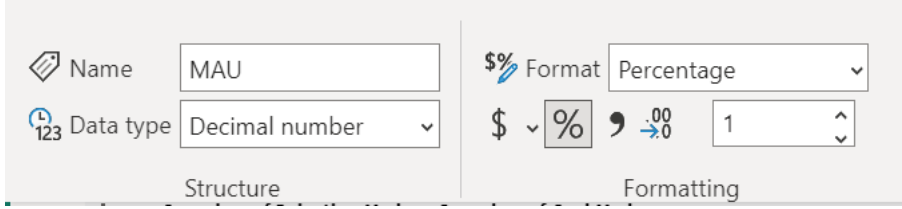
2. Visual Type: Card
   Field: Standard Deviation of MAU

Try 1:
```
SUM(Injection_MAU[active_std])
```

Try 2:
```
"(± " & SUM(Injection_MAU[active_std]) &")"
```

Try 3:
```
"(± " & Round(SUM(Injection_MAU[active_std]),2) &")"
```

Power BI visual #6



KPI: Differences in MAU compare to last month

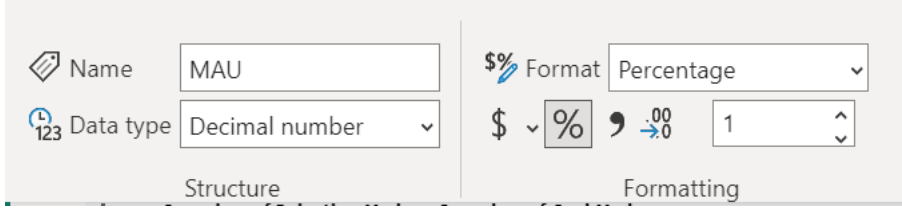
1. Visual Type: Card

Field: Monthly MAU differences

Try 1:
```
Var mau_diff= SUM (‘table_name’[MAU_Diff])
```

Try 2:
```
Var mau_diff= ROUND(SUM (‘table_name'[MAU_Diff]),2)
RETURN
IF(mau_diff>0, “+” & mau_diff & “%”,
   mau_diff  & "%")
```

Power BI visual #6-1



KPI: Differences in MAU compare to last month

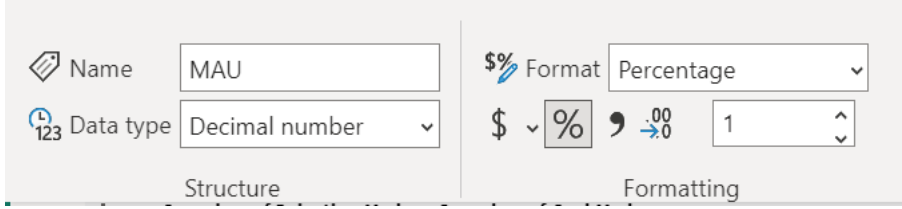
2. Visual Type: Card

Field: Emoji for Monthly MAU differences

```
Var mau_diff= ROUND(SUM ('table_name'[MAU_Diff]),2)
RETURN
IF(
    mau_diff>0, "😃" ,
    IF (mau_diff<0, UNICHAR(128577), UNICHAR(128528))
)
```

[Reference for UNICHAR]

Power BI visual #6-1



KPI: The proportion of each user types monthly

(User Types: active user, non-active user, potential user, completed user)

1. Visual Type2 :Pie
   (Proportion of active, and non-active user)

   Legend: Patient/ User Types
   Value: percentage of active and non-active user

2. Visual Type: Pie
   (Proportion of in-program user, potential user and completed user)

   Legend: Patient/User Type Parent
   Value: percentage of in-program, potential and completed user

THE PARTNER YOU CAN TRUST.
TOGETHER, WE ARE PRIMED TO MAKE THE WORLD BETTER WITH OUR CLIENTS.