Learner’s guide to Creating Program Indicators

PERFORM THESE EXERCISES on the INDICATOR SYSTEM

Use your initials when making an indicator

What is this guide?

This guide contains all ungraded exercises and detailed steps to perform them related to program access levels for the Tracker Config Level 1 academy. Please perform each of the exercises when prompted to by your instructors

Learning objectives for this session

By the end of this session, users should be familiar with the basics in creating program indicators within DHIS2. Users should also be aware of how program indicators can be combined with aggregate data elements to create combined indicators. There are several concepts that the participant should be familiar with by the end of this session:

1. Describe the concept of a program indicator
2. Describe the individual components that are part of a program indicator
    1. Aggregation type
    2. Analytics type
    3. Expression
    4. Filter
3. Create program indicators in DHIS2
4. Create combined indicators in DHIS2

Guided Exercise Overview

Exercise 1

Program: TB Treatment Card

Indicator: Extra-Pulmonary TB

Short name: EPTB

Aggregation Type : Count

Analytics Type : Event

Exercise 2

Program: TB Treatment Card

Indicator: New, Pulmonary TB cases

Short name: NPTB

Aggregation Type : Count

Analytics Type : Event

Exercise 3

Program: TB Treatment Card

Indicator: TO - failure or died

Short name: TO - failure or died

Aggregation Type : Count

Analytics Type : Event

Create a copy of this indicator with the same characteristics, but filter out Sex = Male, Age > 60

Exercise 4

Program: TB Treatment Card

Indicator: Hospitalized - Initial and Continuation

Short name: All Treatment Hospitalized

Code: AT_HOSP

Aggregation Type : Count

Analytics Type : Enrollment

Exercise 5

Program: TB Treatment Card

Indicator: Weight Change

Short name: Weight Change

Code: TB_WC

Aggregation Type : Average

Analytics Type : Enrollment

Create a program indicator of enrollment type. This should calculate the difference in weight between the Initial Diagnosis and End of Treatment program stages when the culture result is negative and the treatment outcome is either cured or completed.

Exercise 6

Combined indicator

Program: TB Treatment Card

Indicator: TB incidence rate per 100,000

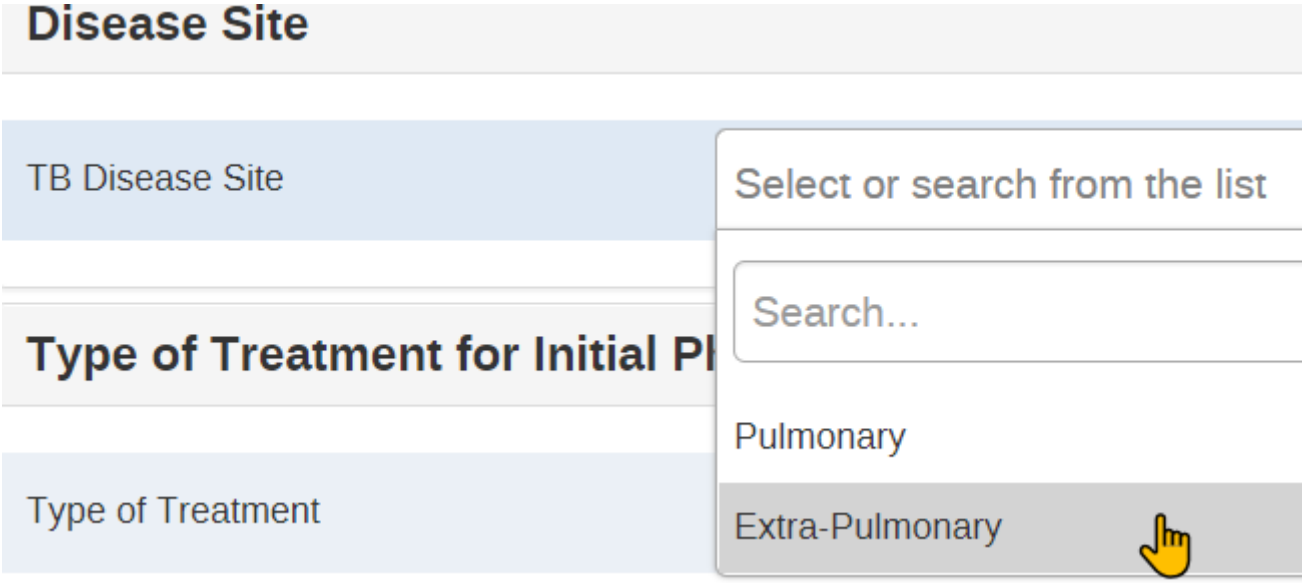
Numerator: TB new cases

Denominator: Population Total

Exercise 1 - Indicator 1 : EPTB Cases

Conceptualize the indicator

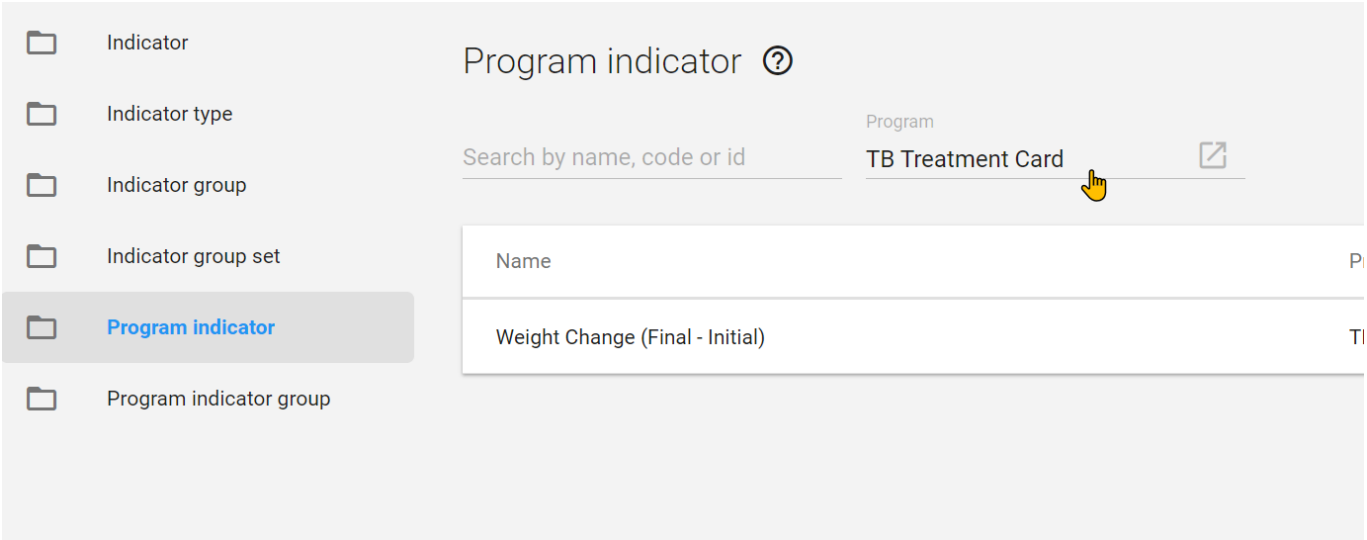
We want to COUNT the number of extra-pulmonary TB cases. This is taken from the field disease site, which has an option set where I can select this value.



Edit the indicator details

Navigate to maintenance -> Indicator-> Program Indicator

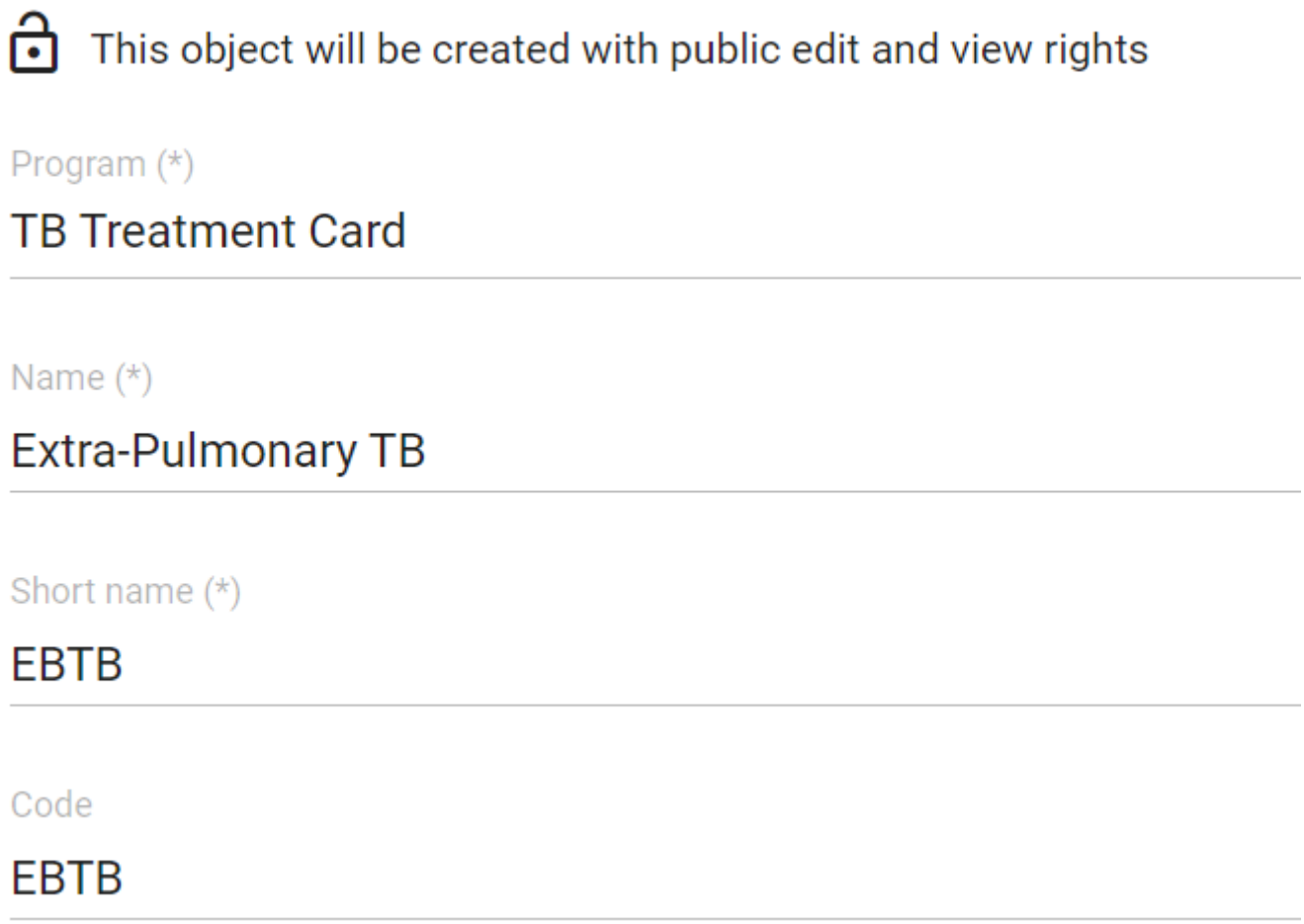
Select “TB Treatment Card” as the program



Add a new indicator and edit the program indicator details

Select the blue plus sign to add a new indicator.

First, edit the name, short name and code details.



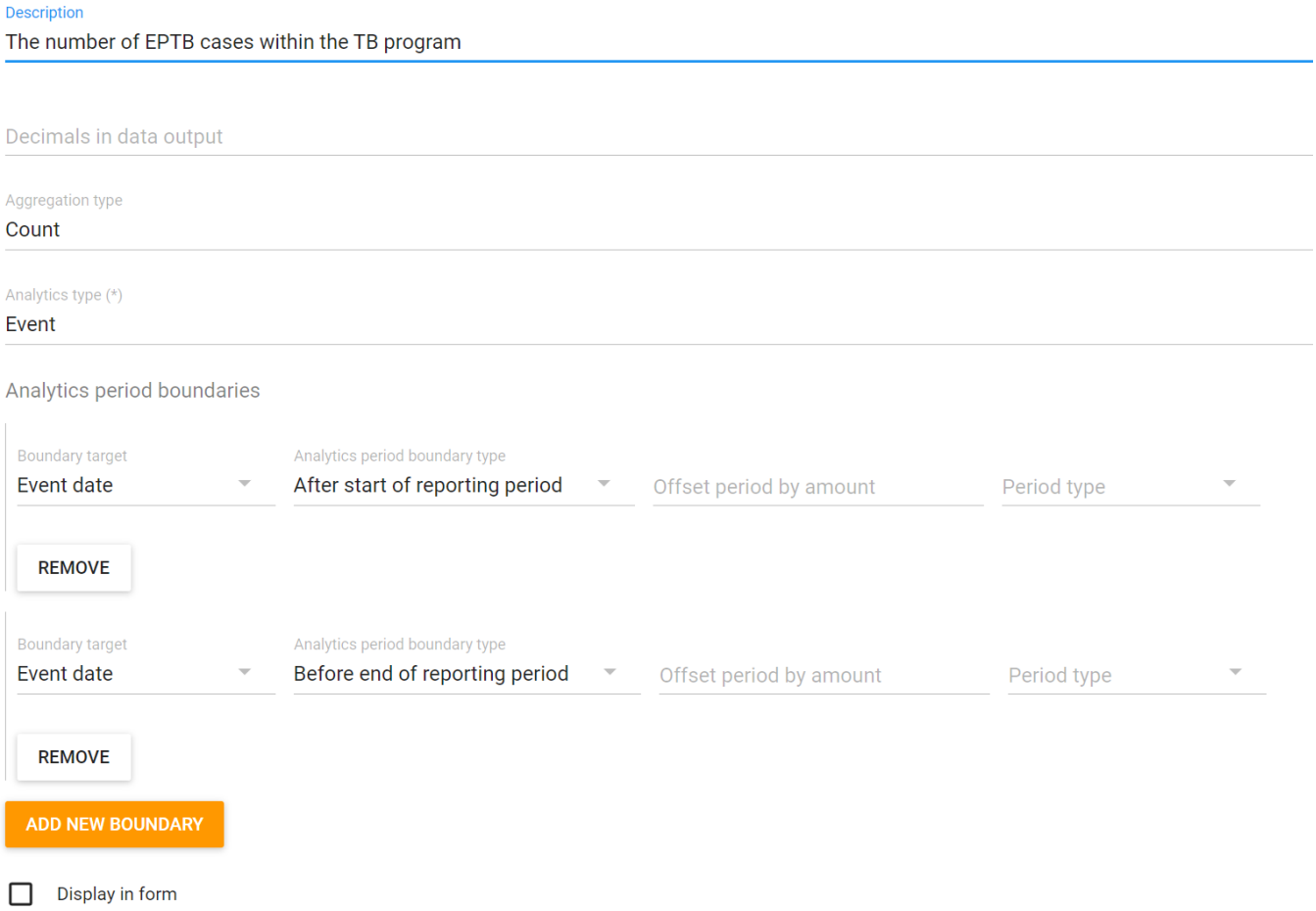
Skip color and icon

Next, add a description.

Review the aggregation type, what are we trying to do with this indicator? We want to COUNT the number of cases that are EPTB.

Review the analytics type. We only need data from one stage in the program, and this stage is not repeated. In this scenario, the analytics type is EVENT.

After selecting the analytics type, you will see “Analytics period boundaries.” Leave these all as default, we will not cover them in this academy. You can learn more about them in the docs.

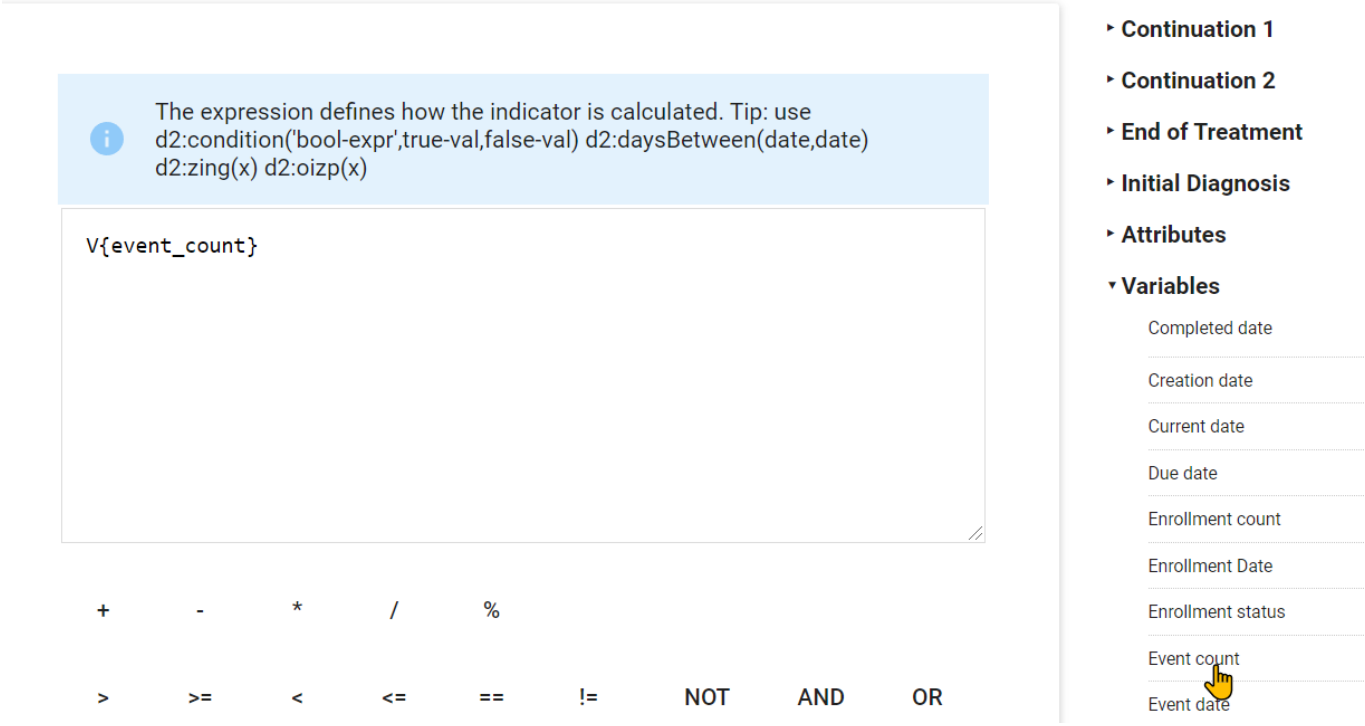


Edit the expression

Select the expression tab in order to edit the expression. This is where we define what we want to happen mathematically.

> When you create a program indicator in a tracker program, you will see all of the program stages located on the right side menu. From here, you can select any of the data elements belonging to those stages. You will also be able to select the attributes that belong to the program. In addition, we also have variables and constants that we can use in our calculations.

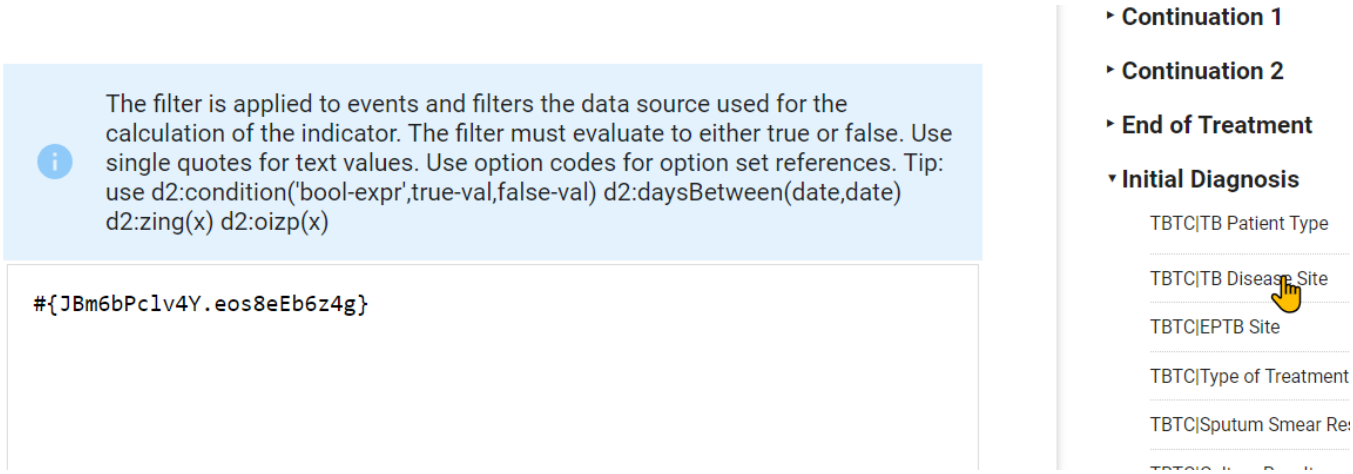
In this case, we can use a simple variable, called event count, to define our expression. This is because we want to count the number of events that meet a certain criteria. This is a variable you will likely find yourself using quite often.



Edit the filter

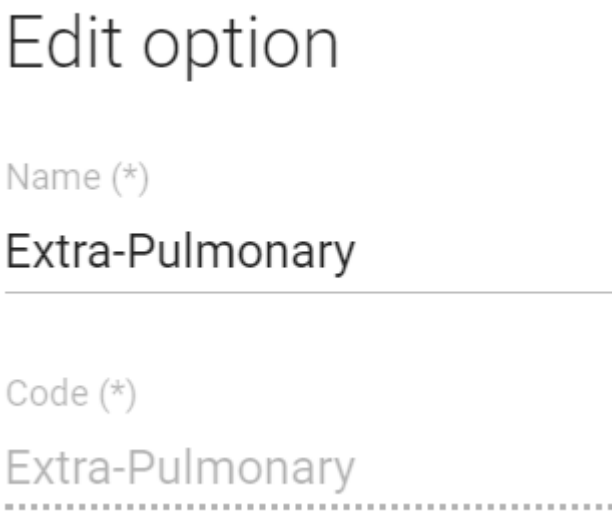
Select the filter tab in order to edit the filter. Here we define what criteria we want to include in our mathematical calculation. We want to count events, but which ones? In our case, those where the disease site is extra pulmonary.

Disease site is a data element in our program, so we can select it

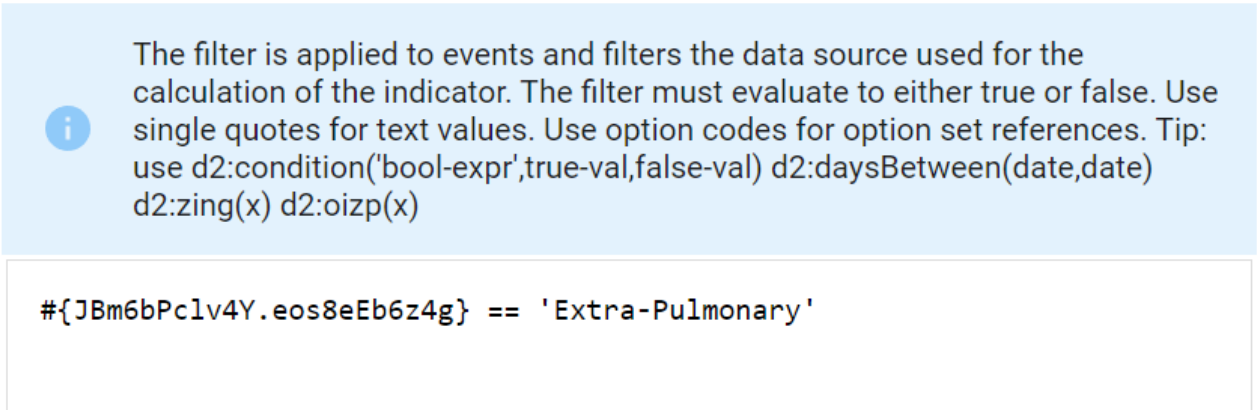


Next, we can use our operator ‘equals to.’

In program indicators, options are identified via their code within an option set. In this example, the name and the code are the same, but if you are not familiar with the metadata, it is usually a good idea to check the code of the option you are using.



Copy the code and add it into the filter. We add it in between quotes as it is a text value. All text values need to be in-between quotes.



Test the program indicator

Now that you have created the program indicator, it is a good idea to test if it is functional. You can compare the properly configured indicator with the one you have created to ensure that the value is correct. In order to do this you can navigate to the pivot table app.

Navigate to the data visualizer app

Create a new pivot table with the following details

- Data : the program indicator you made, the program indicator “Extra Pulmonary TB”
- Period : Last year
- Organisation Unit : Trainingland

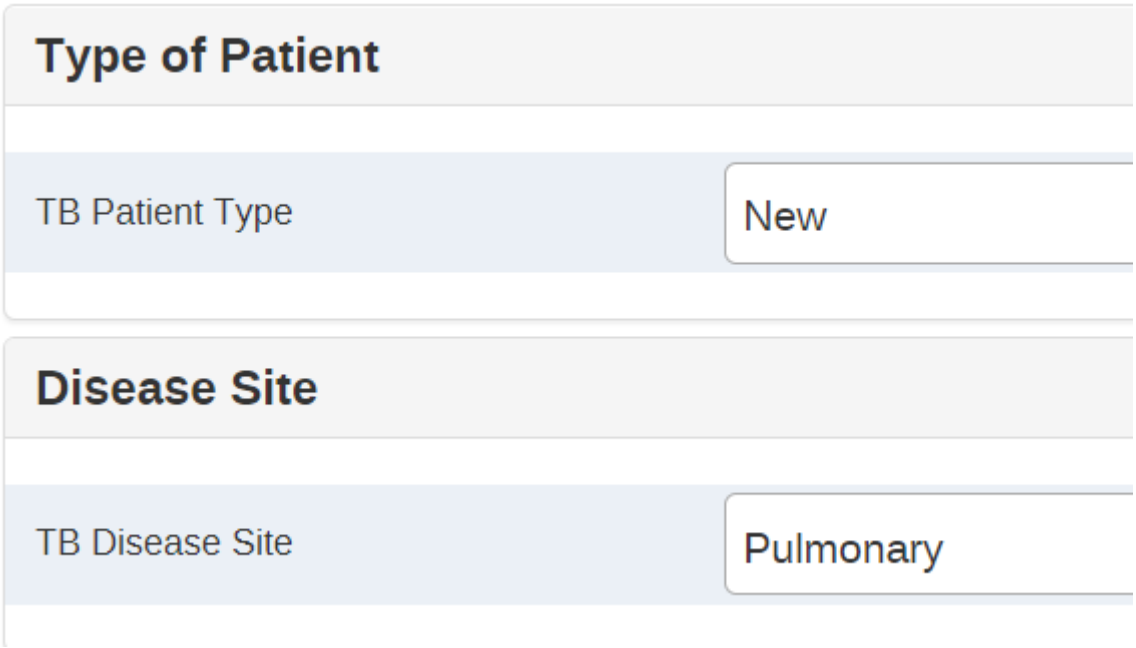
Click on update to verify that the values are equal in the indicators. This will provide some validation that the indicator is created correctly.

Trainingland		
	KT_Extra Pulmonary TB	Extra Pulmonary TB
2023	27	27

Exercise 2 - Indicator 2 : New, Pulmonary TB Cases

Conceptualize the indicator

We want to COUNT the number of New, Pulmonary TB cases

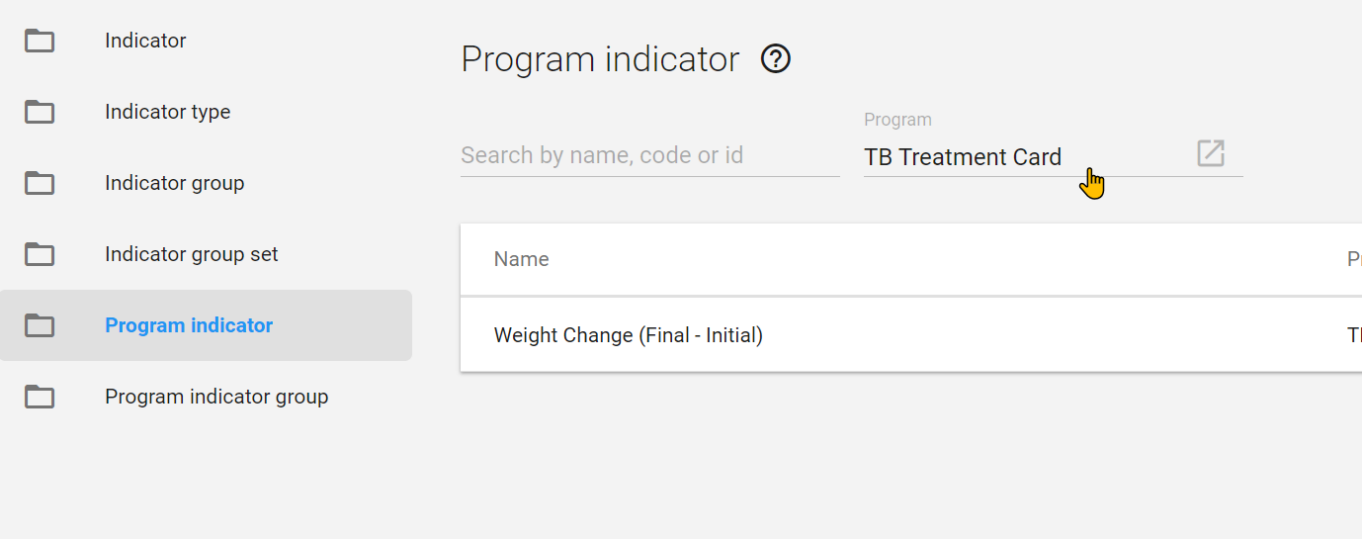


These values are taken from 2 different data elements, TB Patient Type and TB Disease Site, both with option set values to select from. This means that we will need to consider the codes of these values again.

Edit the indicator details

Navigate to maintenance -> Indicator-> Program Indicator

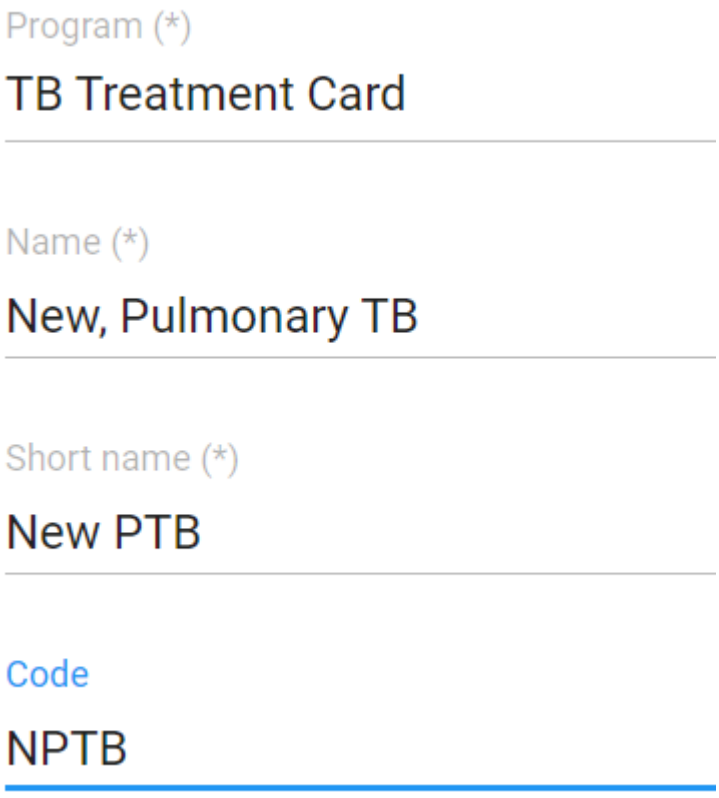
Select “TB Treatment Card” as the program



Add a new indicator and edit the program indicator details

Select the blue plus sign to add a new indicator.

First, edit the name, short name and code details.



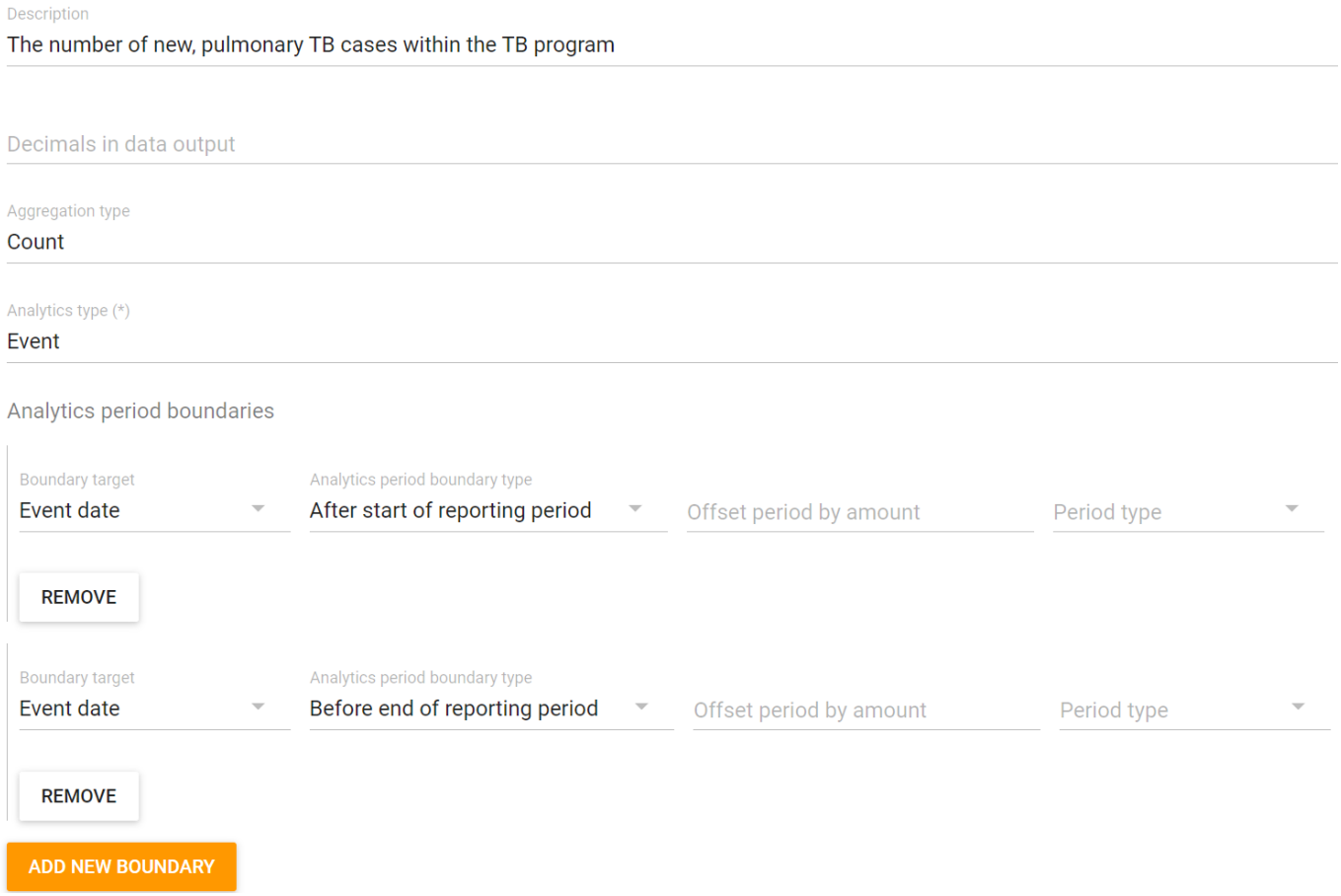
Skip color and icon

Next, add a description.

Review the aggregation type, what are we trying to do with this indicator? We want to COUNT the number of cases that are EPTB.

Review the analytics type. We only need data from one stage in the program, and this stage is not repeated. In this scenario, the analytics type is EVENT.

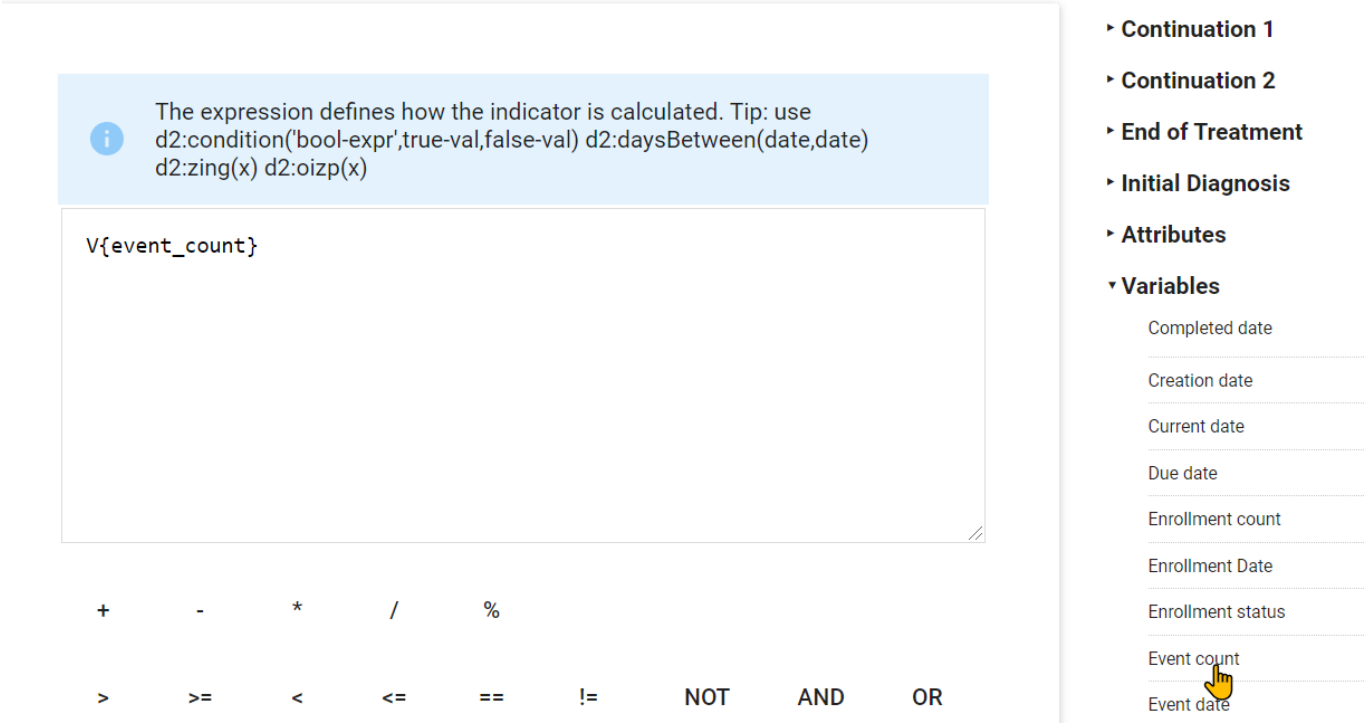
After selecting the analytics type, you will see “Analytics period boundaries.” Leave these all as default, we will not cover them in this academy. You can learn more about them in the docs.



Edit the expression

Select the expression tab in order to edit the expression. This is where we define what we want to happen mathematically.

In this case, we can use a simple variable, called event count, to define our expression. This is because we want to count the number of events that meet a certain criteria. This is a variable you will likely find yourself using quite often.



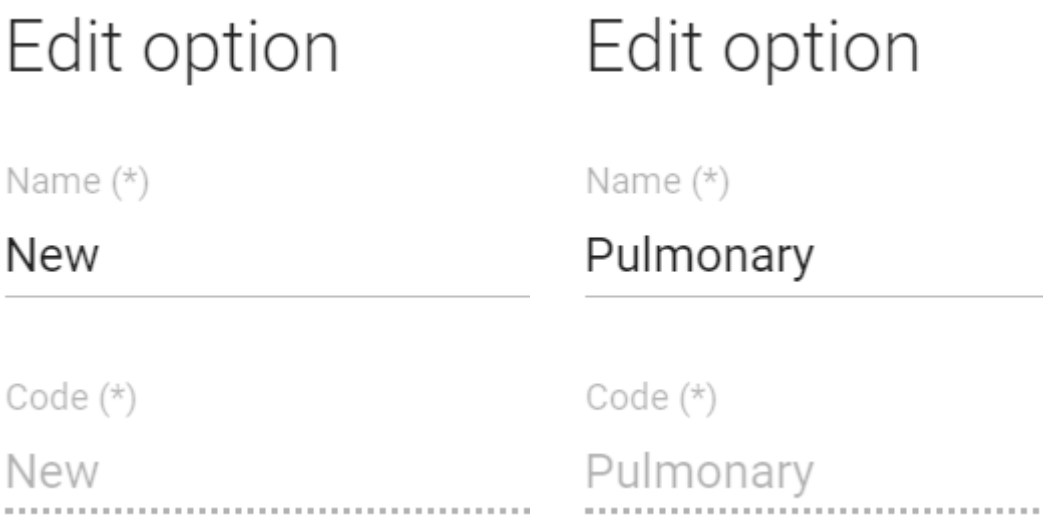
Edit the filter

Select the filter tab in order to edit the filter. Here we define what criteria we want to include in our mathematical calculation. We want to count events, but which ones? In our case, those where the patient type is new AND the disease site is pulmonary.

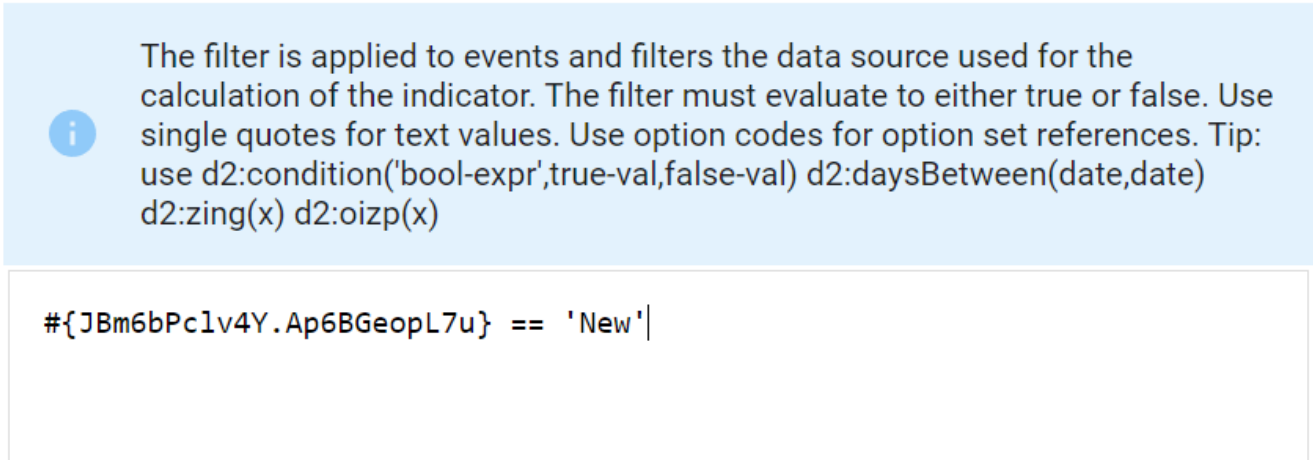
Patient Type and Disease site is a data element in our program, so we can select them. Let us first select Patient type

Next, we can use our operator 'equals to.'

In program indicators, options are identified via their code within an option set. In this example, the name and the code are the same, but if you are not familiar with the metadata, it is usually a good idea to check the code of the option you are using.



Copy the code and add it into the filter. We add it in between quotes as it is a text value. All text values need to be in-between quotes.



In order for this indicator to meet our required criteria, the patient has to be new AND the disease site has to be pulmonary. We therefore must use the ‘and’ logical operator in this scenario. Select the disease site data element and complete the filter.

```
#{JBm6bPclv4Y.Ap6BGeopL7u} == 'New' and  #{JBm6bPclv4Y.eos8eEb6z4g} ==
'Pulmonary'
```

+ - * / %

> >= < <= == != NOT AND OR

if(isNull(isNotNull(firstNonNull(greatest(least(log(

log10(.periodOffset(

Initial Diagnosis\.TBTC|TB Patient Type == 'New' and Initial Diagnosis\.TBTC|TB Disease Site == 'Pulmonary'

Test the program indicator

Now that you have created the program indicator, it is a good idea to test if it is functional. You can compare the properly configured indicator with the one you have created to ensure that the value is correct. In order to do this you can navigate to the pivot table app.

Navigate to the data visualizer app

Create a new pivot table with the following details

- Data : the program indicator you made, the program indicator “New, Pulmonary TB”
- Period : Last year
- Organisation Unit : Trainingland

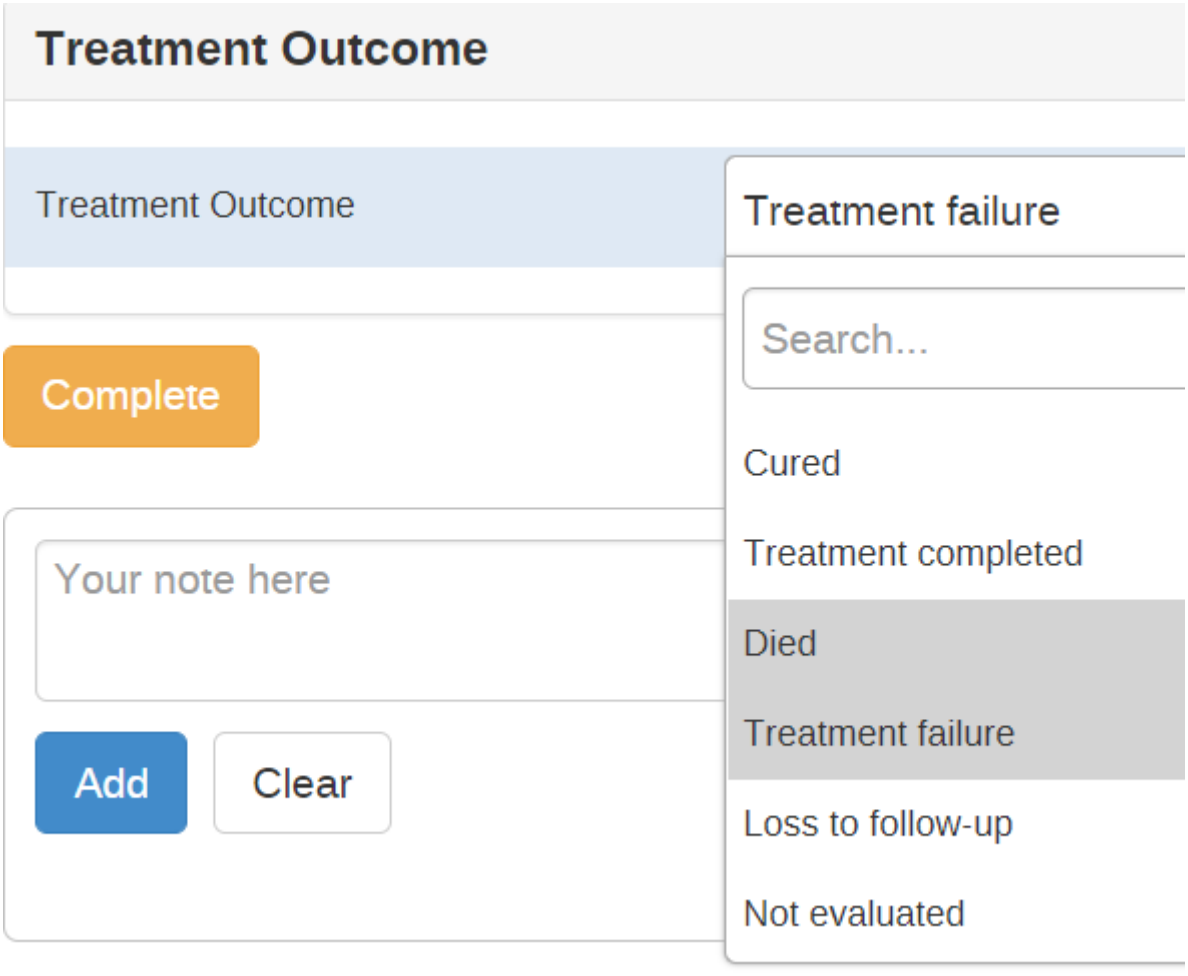
Click on update to verify that the values are equal in the indicators. This will provide some validation that the indicator is created correctly.

Trainingland		
	KT_New, Pulmonary TB	New, Pulmonary TB
2023	1 695	1 695

Exercise 3 - Indicator 3 : Patients on who failed treatment or died

Conceptualize the indicator

We want to COUNT the number of cases that either died or treatment failed

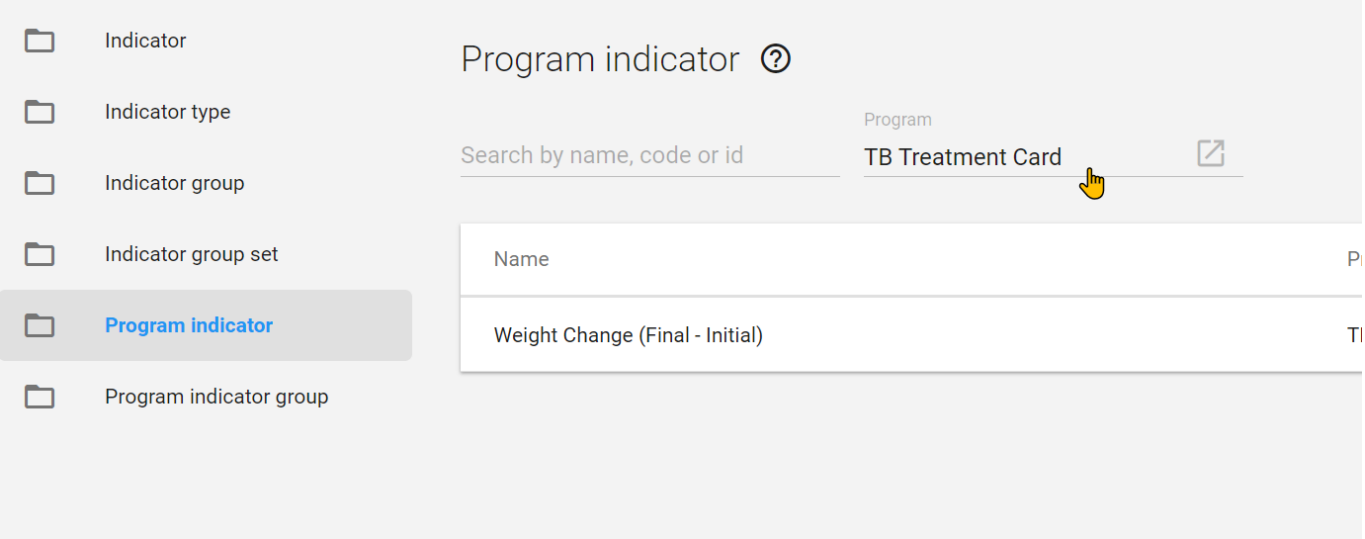


These values are taken from 1 data element, Treatment Outcome, with option set values to select from. This means that we will need to consider the codes of these values again.

Edit the indicator details

Navigate to maintenance -> Indicator-> Program Indicator

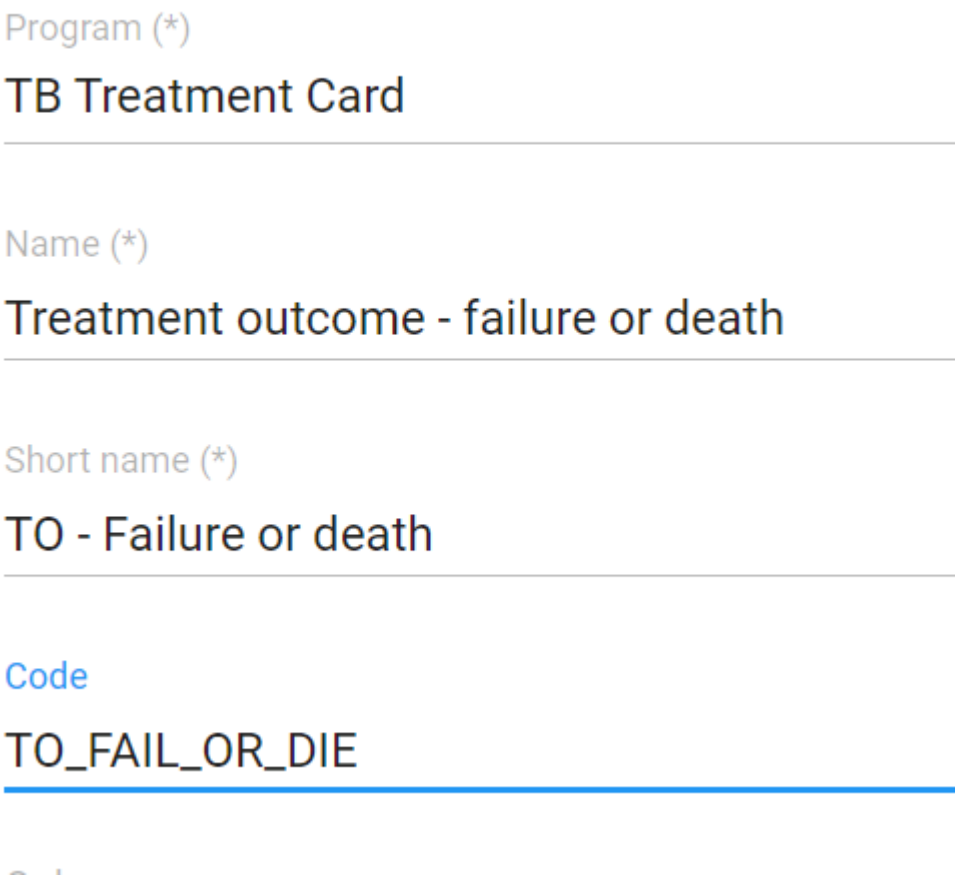
Select “TB Treatment Card” as the program



Add a new indicator and edit the program indicator details

Select the blue plus sign to add a new indicator.

First, edit the name, short name and code details.



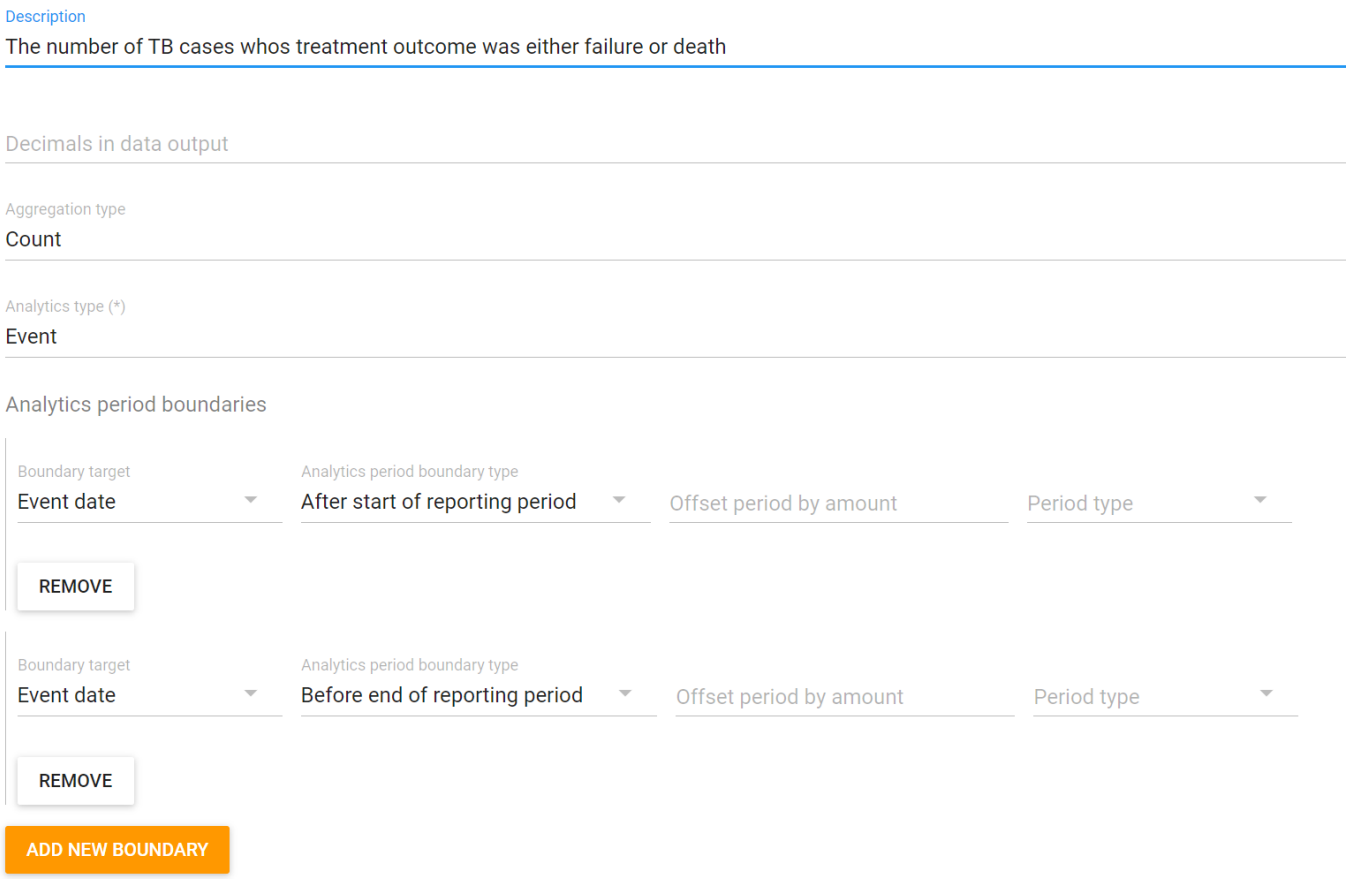
Skip color and icon

Next, add a description.

Review the aggregation type, what are we trying to do with this indicator? We want to COUNT the number of cases that are either on facility or community based DOT.

Review the analytics type. We only need data from one stage in the program, and this stage is not repeated. In this scenario, the analytics type is EVENT.

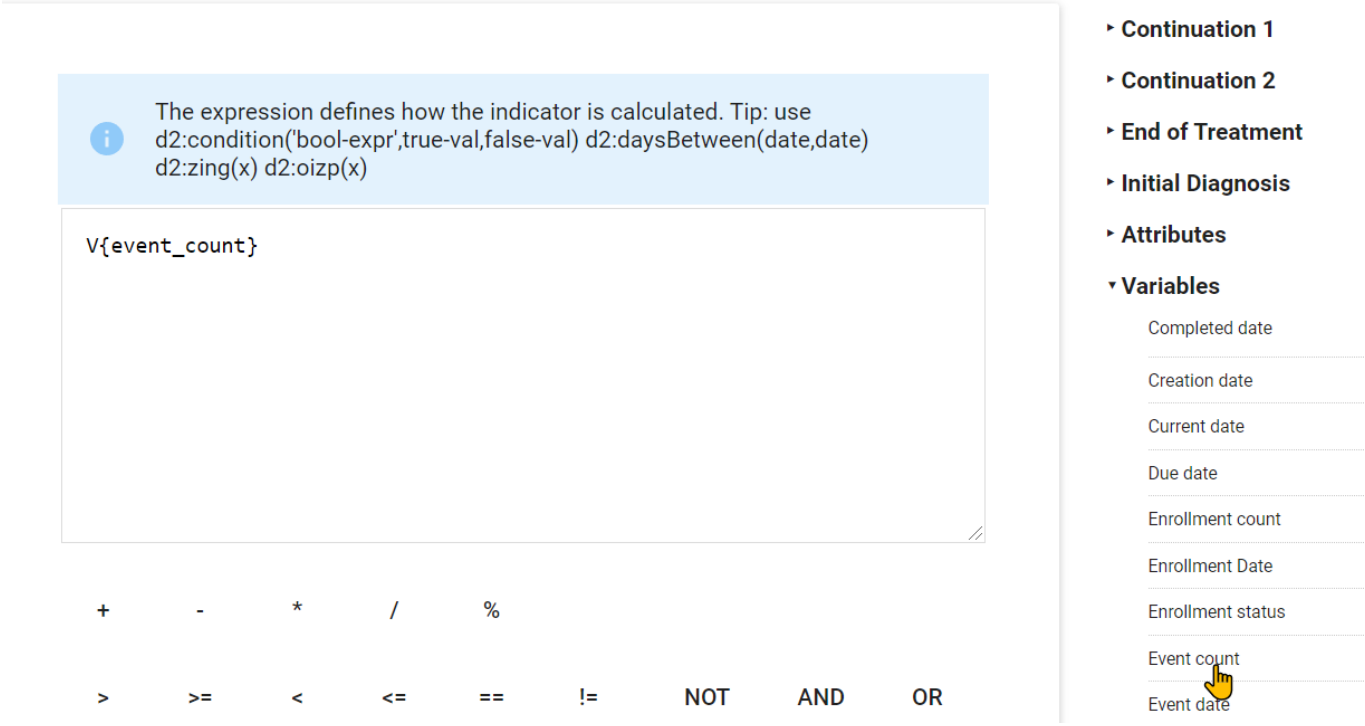
After selecting the analytics type, you will see “Analytics period boundaries.” Leave these all as default, we will not cover them in this academy. You can learn more about them in the docs.



Edit the expression

Select the expression tab in order to edit the expression. This is where we define what we want to happen mathematically.

In this case, we can use a simple variable, called event count, to define our expression. This is because we want to count the number of events that meet a certain criteria. This is a variable you will likely find yourself using quite often.



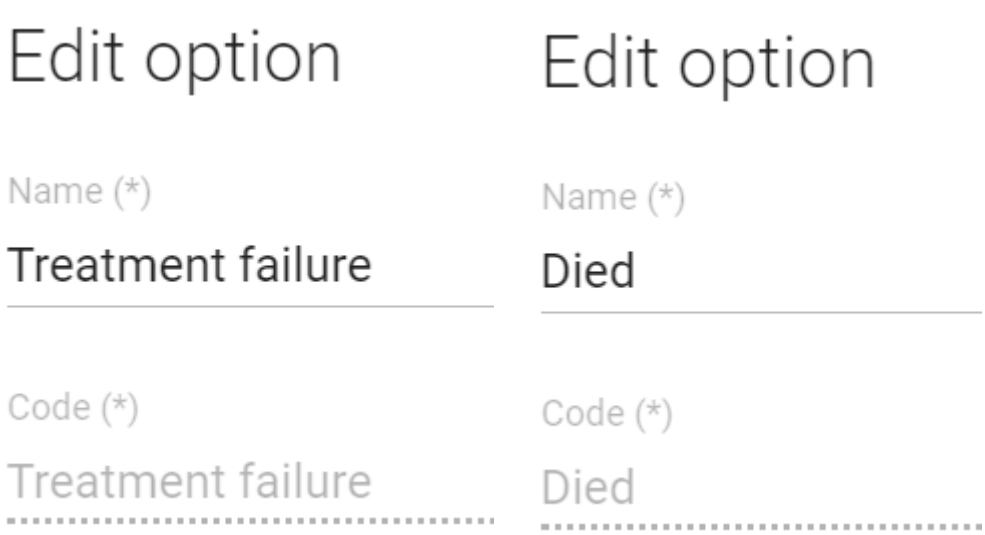
Edit the filter

Select the filter tab in order to edit the filter. Here we define what criteria we want to include in our mathematical calculation. We want to count events, but which ones? In our case, those where the treatment outcome is either treatment failure or died.

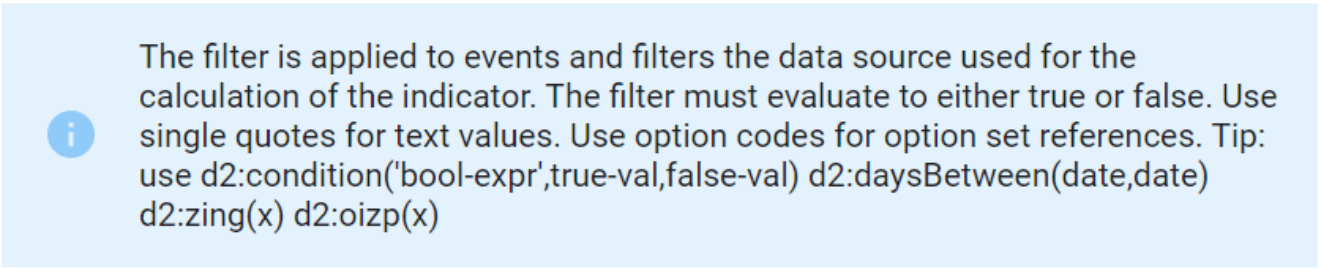
Treatment outcome is a data element in the end treatment stage of our program, so we can select it.

Next, we can use our operator 'equals to.'

In program indicators, options are identified via their code within an option set. In this example, the name and the code are the same, but if you are not familiar with the metadata, it is usually a good idea to check the code of the option you are using.



Copy the code and add it into the filter. We add it in between quotes as it is a text value. All text values need to be in-between quotes.



In order for this indicator to meet our required criteria, the patient can be on facility based OR community based DOT. We therefore must use the ‘or’ logical operator in this scenario. Select the disease site data element and complete the filter.

The filter is applied to events and filters the data source used for the calculation of the indicator. The filter must evaluate to either true or false. Use single quotes for text values. Use option codes for option set references. Tip: use d2:condition('bool-expr',true-val,false-val) d2:daysBetween(date,date) d2:zing(x) d2:oizp(x)

```
#{iXw8SKe7k8i.VjK4J8h7dMF} == 'Treatment failure' or #
{iXw8SKe7k8i.VjK4J8h7dMF} == 'Died'
```

+ - * / %

> >= < <= == != NOT AND OR

if(isNull(isNotNull(firstNonNull(greatest(least(log(

log10(.periodOffset(

End of Treatment\.TBTC|Treatment Outcome == 'Treatment failure' or
End of Treatment\.TBTC|Treatment Outcome == 'Died'

Test the program indicator

Now that you have created the program indicator, it is a good idea to test if it is functional. You can compare the properly configured indicator with the one you have created to ensure that the value is correct. In order to do this you can navigate to the pivot table app.

Navigate to the data visualizer app

Create a new pivot table with the following details

- Data : the program indicator you made, the program indicator “Treatment outcome - failure or death”
- Period : Last year
- Organisation Unit : Trainingland

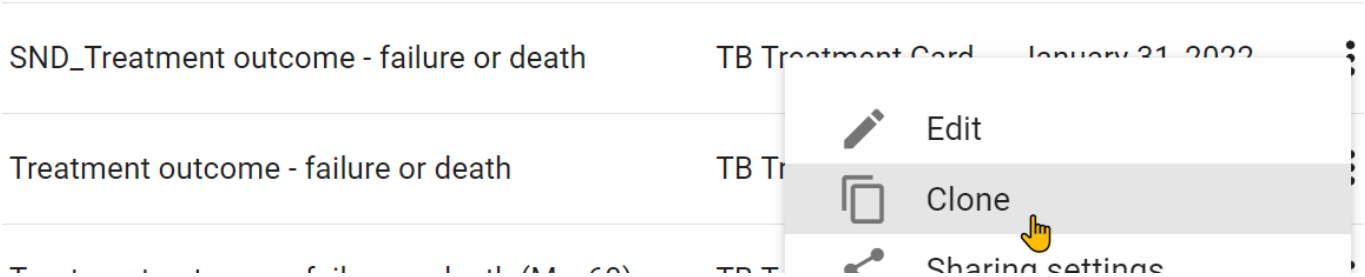
Click on update to verify that the values are equal in the indicators. This will provide some validation that the indicator is created correctly.

Trainingland		
	Treatment outcome - failure or death	KT_Treatment outcome - failure or death
2023	37	37

Exercise 3 Part 2 - Adding more filters

What if we want to modify this indicator to only count those cases that were Male and >60?

In order to do this, we need to modify our indicator filter. As we are adding on to the previous indicator, let us find it and clone it.



Update the name, short name, code and description

Program (*)

TB Treatment Card

Name (*)

Treatment outcome - failure or death (M, >60)

Short name (*)

TO - Failure or death (M, >60)

Code

TO_FAIL_OR_DIE_M_>60

Description

The number of male TB cases < 60 whos treatment outcome was either failure or death

Aggregation type and analytics type remain the same.

The expression is also the same. We do need to update our filter however.

```
(#{iXw8SKe7k8i.VjK4J8h7dMF} == 'Treatment failure' or #
{iXw8SKe7k8i.VjK4J8h7dMF} == 'Died') and A{tJnr3mrNs21} == 'MALE' and
A{CVYtEunMUU3} > 60
```

+ - * / %

> >= < <= == != NOT AND OR

if(isNull(isNotNull(firstNonNull(greatest(least(log(

log10(.periodOffset(

(End of Treatment\.TBTC|Treatment Outcome == 'Treatment failure' or End of Treatment\.TBTC|Treatment Outcome == 'Died') and Sex == 'MALE' and Age > 60

Let's review what's changed.

1. We introduced grouping by bracketing the or statement
2. We added two additional filters for age and sex using and statements

Note that if you are grouping multiple and/or conditions together to create a specific filter criteria, then you will need to use brackets. This acts as a sort of order of operations. Save the indicator after you have entered and explained the filter.

After we save this, we should be able to verify this indicator in data visualizer

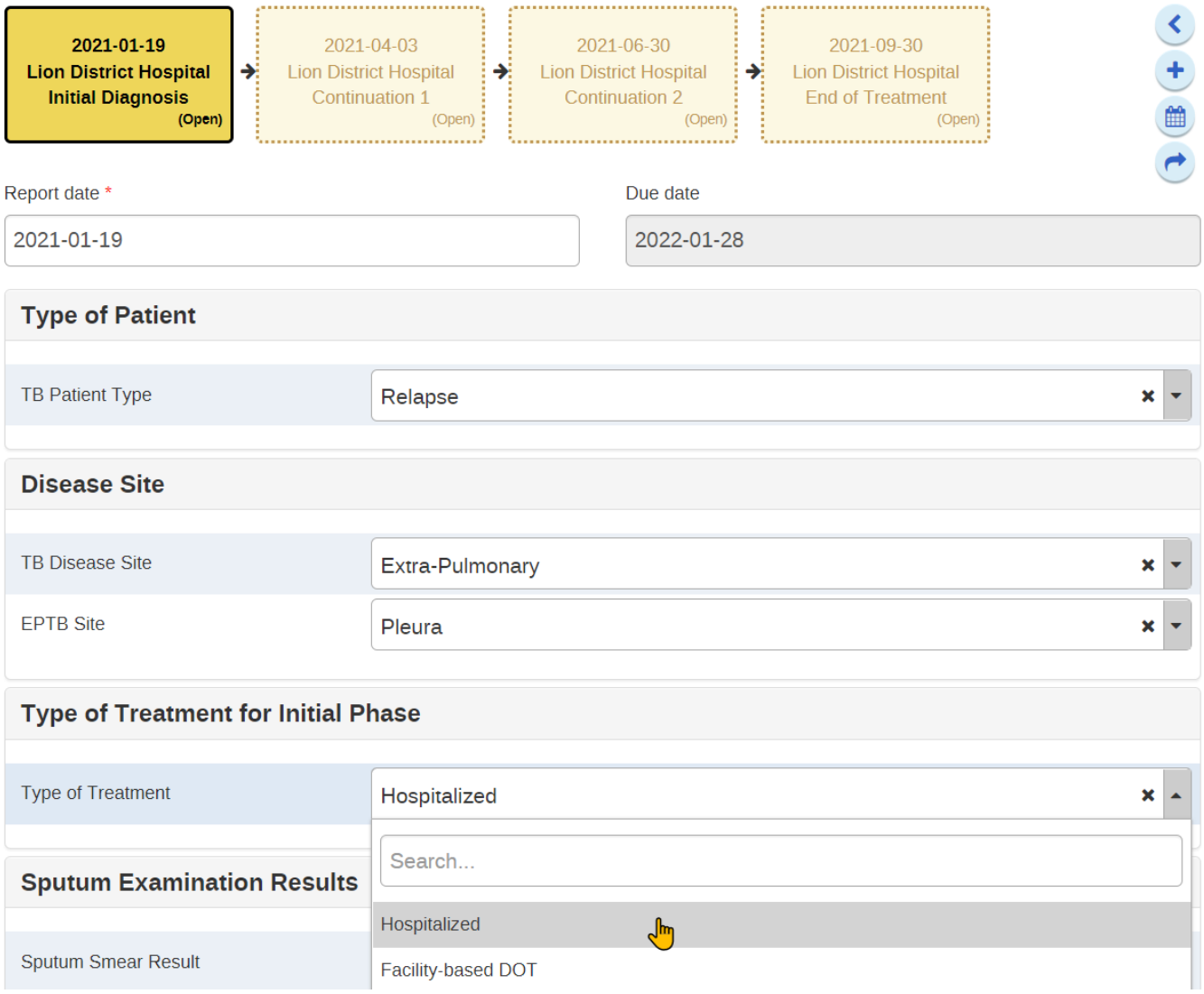
Trainingland		
	KT_Treatment outcome - failure or death M 60+	Treatment outcome - failure or death M 60+
2023	4	4

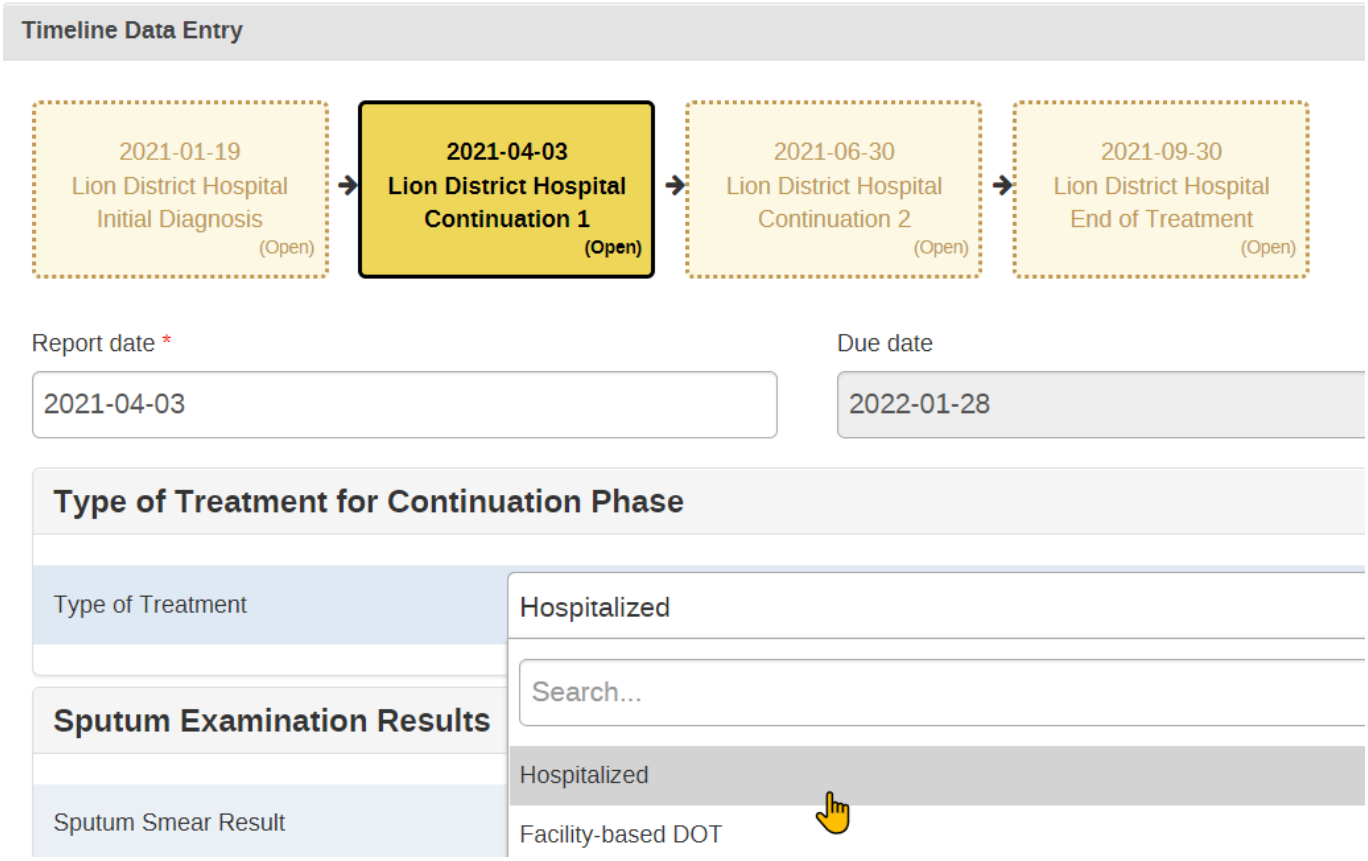
Create Enrollment Type Indicators

Exercise 4 - Indicator 4 : Patients hospitalized the entire treatment

Conceptualize the indicator

We want to COUNT the number of cases that were hospitalized in both the initial AND continuation phases. This means we are retrieving data from 2 program stages.

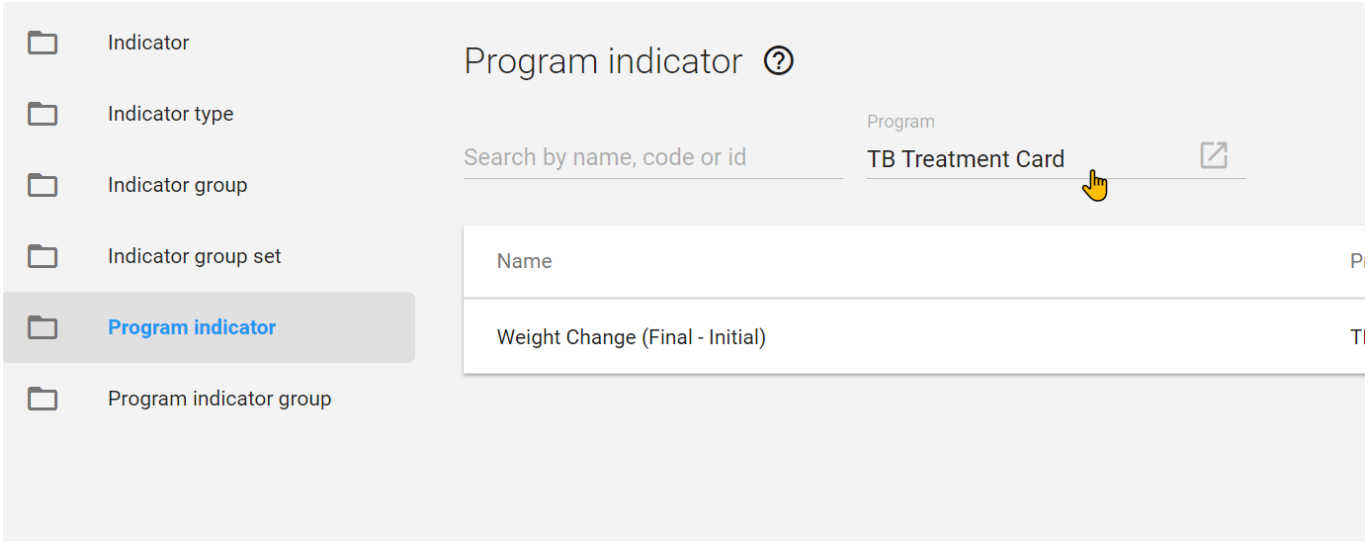




Edit the indicator details

Navigate to maintenance -> Indicator-> Program Indicator

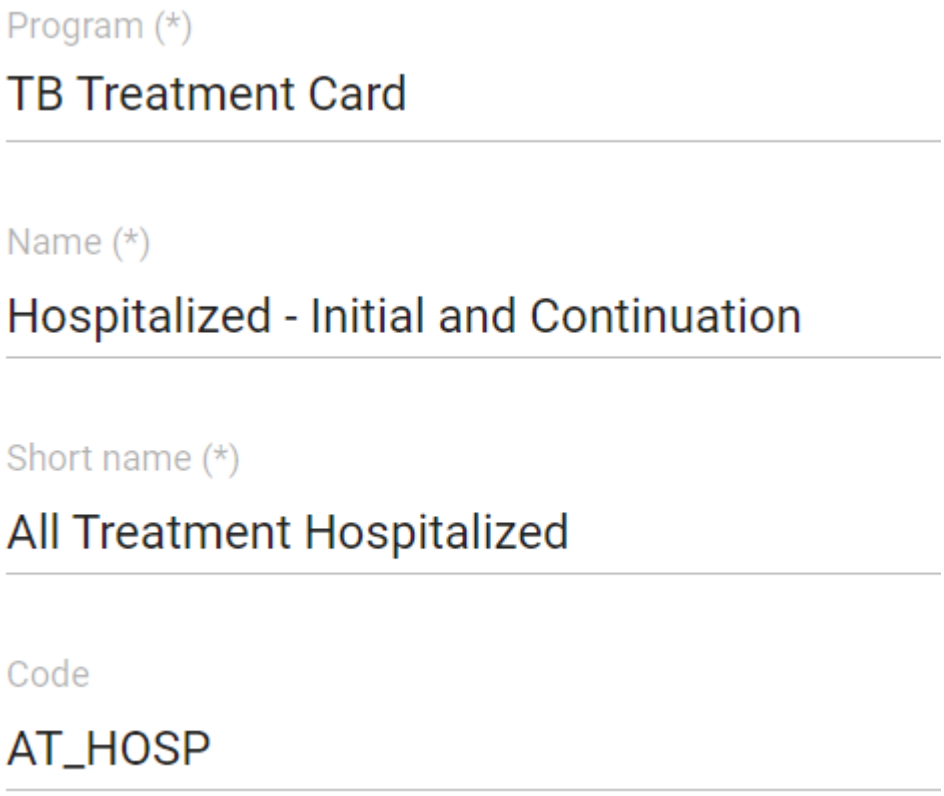
Select “TB Treatment Card” as the program



Add a new indicator and edit the program indicator details

Select the blue plus sign to add a new indicator.

First, edit the name, short name and code details.



Skip color and icon

Next, add a description.

Review the aggregation type, what are we trying to do with this indicator? We want to COUNT the number of cases that were hospitalized during both the initial and continuation phases of treatment.

Review the analytics type. Now we need data from more than one stage, so our analytics type will be ENROLLMENT!

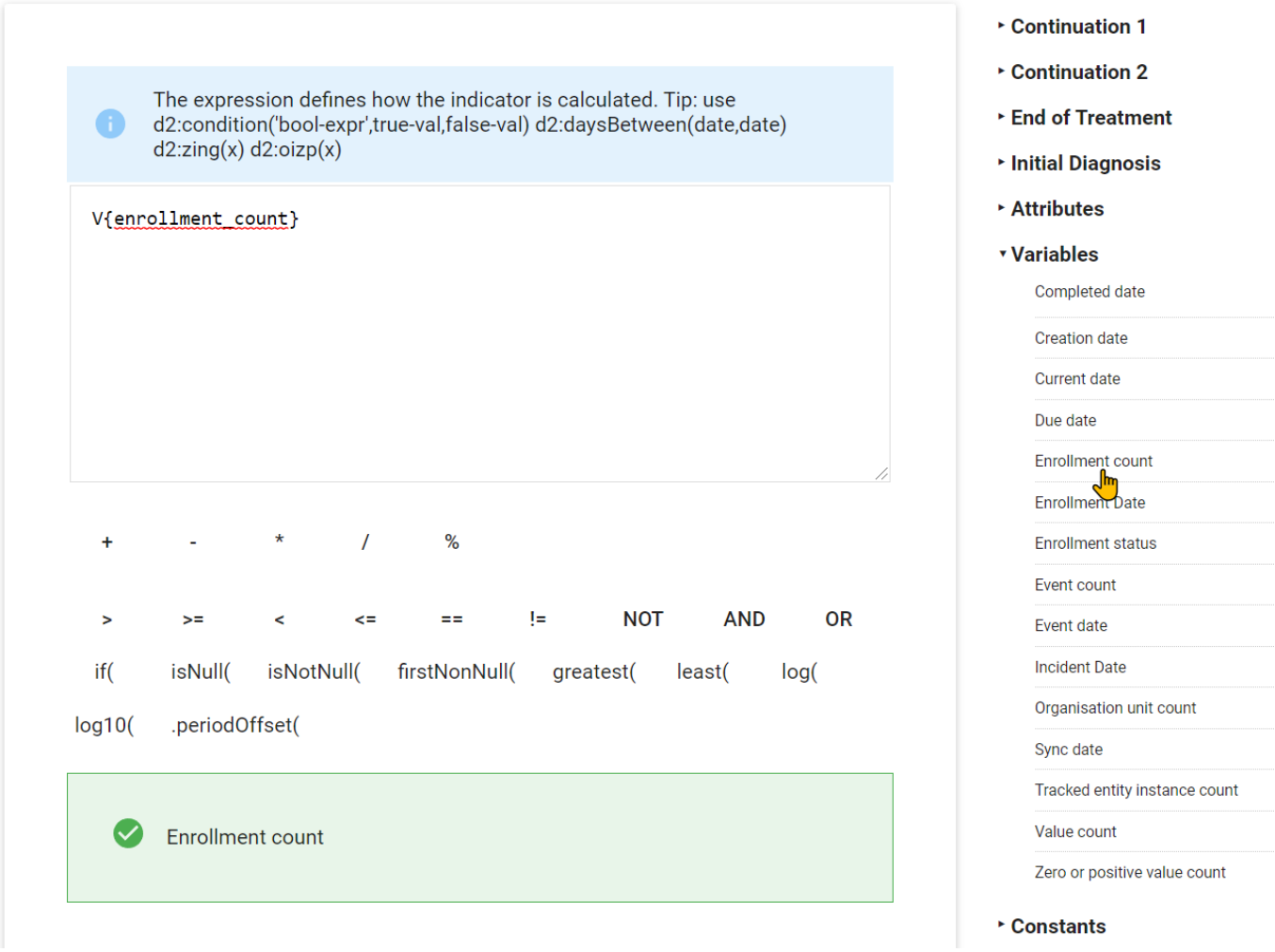
```
In this particular example, we are creating an enrollment indicator which
calculates and displays its information. Note that you can also create a program
indicator that calculates the number of enrollments that meet certain criteria.
This may be useful if, for example, you want to use data elements with option sets
from multiple program stages within the same program in order to filter out the
number of enrollments in calculating your indicator.
```

After selecting the analytics type, you will see “Analytics period boundaries.” Leave these all as default, we will not cover them in this academy. You can learn more about them in the docs.

Edit the expression

Select the expression tab in order to edit the expression. This is where we define what we want to happen mathematically.

In this case, we can use a simple variable, called enrollment count, to define our expression. We are no longer counting events, but enrollments, as we want to combine information across the enrollment and then evaluate it using our filter.

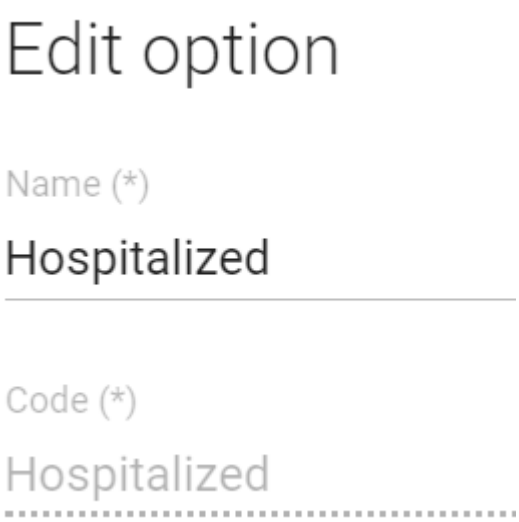


Edit the filter

Select the filter tab in order to edit the filter. Here we define what criteria we want to include in our mathematical calculation. We want to count events, but which ones? In our case, those where the treatment outcome is either treatment failure or died.

Type of treatment is included in both the initial and continuation 1 program stages. Data elements we put into our expression include identification of which program stage it belongs to. This allows us to combine and evaluate data from multiple program stages.

In program indicators, options are identified via their code within an option set. In this example, the name and the code are the same, but if you are not familiar with the metadata, it is usually a good idea to check the code of the option you are using.



Edit the expression

Let’s review the expression

The filter is applied to events and filters the data source used for the calculation of the indicator. The filter must evaluate to either true or false. Use single quotes for text values. Use option codes for option set references. Tip: use d2:condition('bool-expr',true-val,false-val) d2:daysBetween(date,date) d2:zing(x) d2:oizp(x)

```
#{JBm6bPclv4Y.WoYbh91d8TB} == 'Hospitalized' and #
{SXhH8YtwM1Q.WoYbh91d8TB} == 'Hospitalized'
```

+ - * / %

> >= < <= == != NOT AND OR

if(isNull(isNotNull(firstNonNull(greatest(least(log(

log10(.periodOffset(

Initial Diagnosis\.TBTC|Type of Treatment == 'Hospitalized' and Continuation 1\.TBTC|Type of Treatment == 'Hospitalized'

The data elements in our expression are identified as {program stage.data element}. We can see we have the same data element, but the program stage id is different. We can also see this in the green verification box below.

Test the program indicator

Now that you have created the program indicator, it is a good idea to test if it is functional. You can compare the properly configured indicator with the one you have created to ensure that the value is correct. In order to do this you can navigate to the pivot table app.

Navigate to the data visualizer app

Create a new pivot table with the following details

- Data : the program indicator you made, the program indicator “Hospitalized - Initial and Continuation”
- Period : Last year
- Organisation Unit : Trainingland

Click on update to verify that the values are equal in the indicators. This will provide some validation that the indicator is created correctly.

Trainingland		
	KT_Hospitalized - Initial and Continuation	Hospitalized - Initial and Continuation
2023	38	38

Exercise 5 - Indicator 5 - Change in Weight

Navigate back to Indicators -> Program Indicators and click on New to create a new indicator

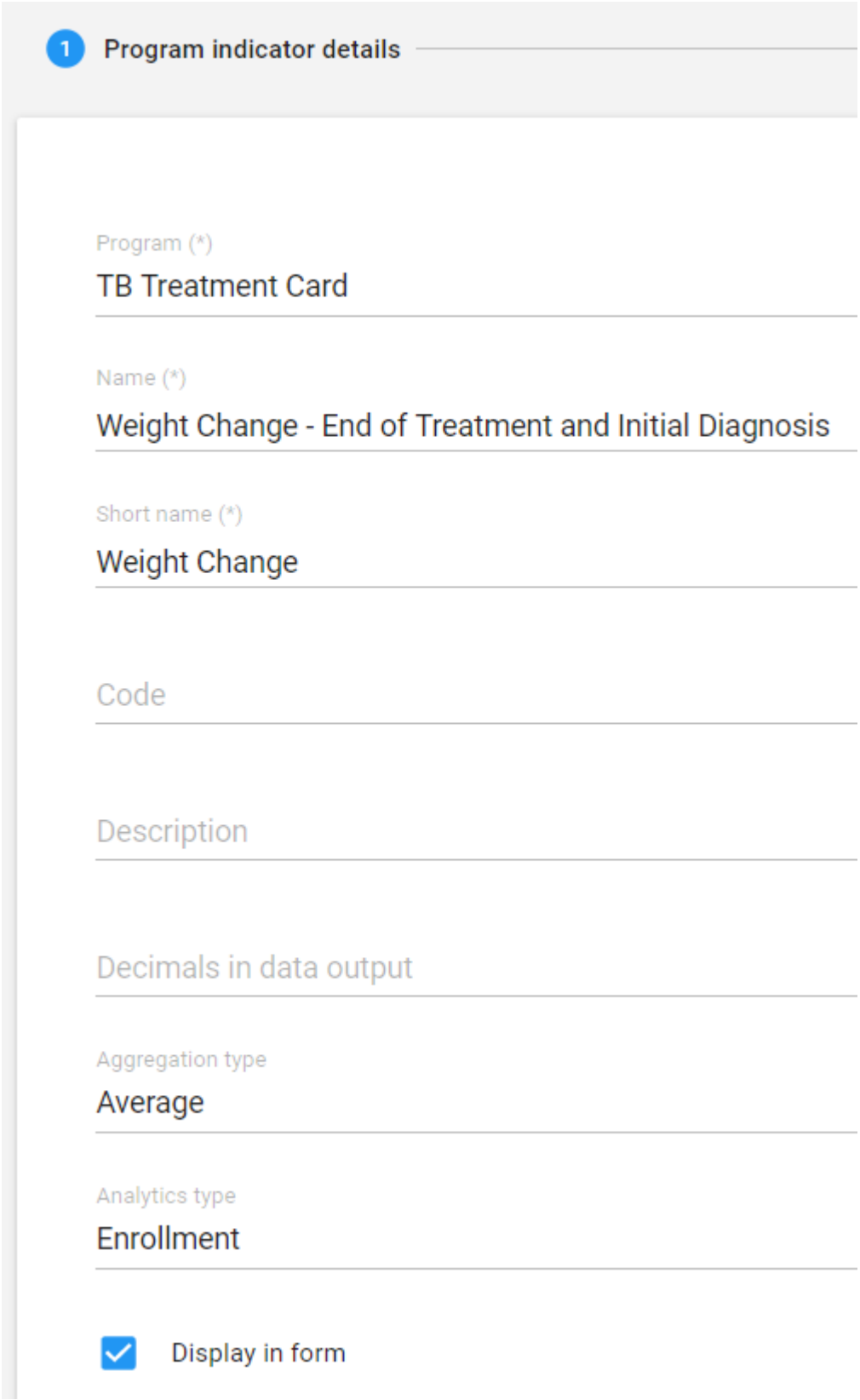
Conceptualize the indicator

Create a program indicator which calculates the difference in weight between the initial diagnosis and end of treatment. This should only be calculated on the condition that the culture result is negative and the treatment outcome is either cured or completed.

Edit the program indicator details

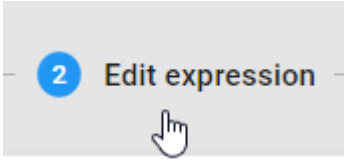
After selecting the plus sign, ensure the program you are working with is selected. Fill in the details as follows (replace your initials with the ones in the screenshot). Note in this case you are using “Enrollment” as the aggregation type. This type of program indicator calculates the indicator using parameters across the entire enrollment, rather than within an event.

We want this indicator to calculate on the fly and then be displayed directly in tracker capture. In order to accomplish this, ensure that “Display in form” is checked.

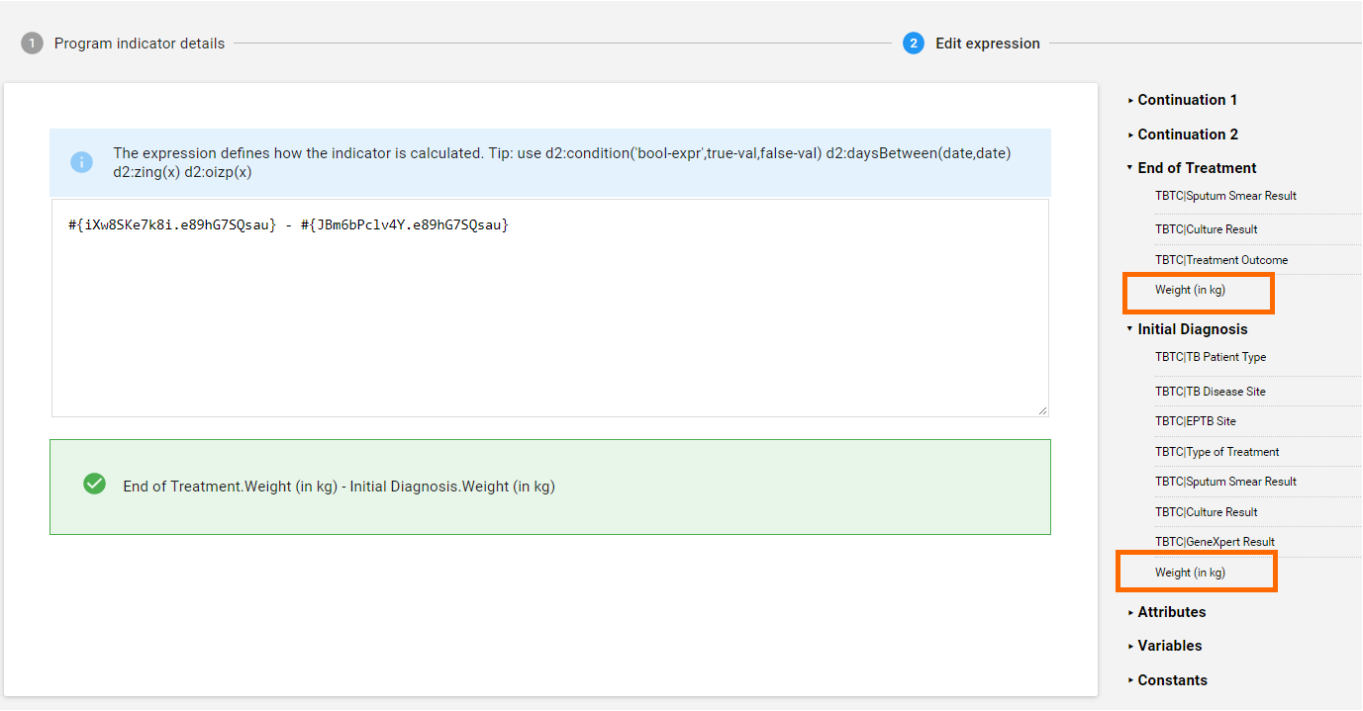


Edit the expression

Select edit expression from the timeline menu

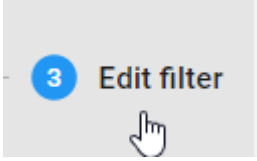


For the expression, you want to take the difference between the weight during the end of treatment stage and the initial diagnosis stage. TB tends to cause additional weight loss often, and after treatment they should hopefully gain some of this back.



Edit the Filter

Select edit filter from the timeline menu

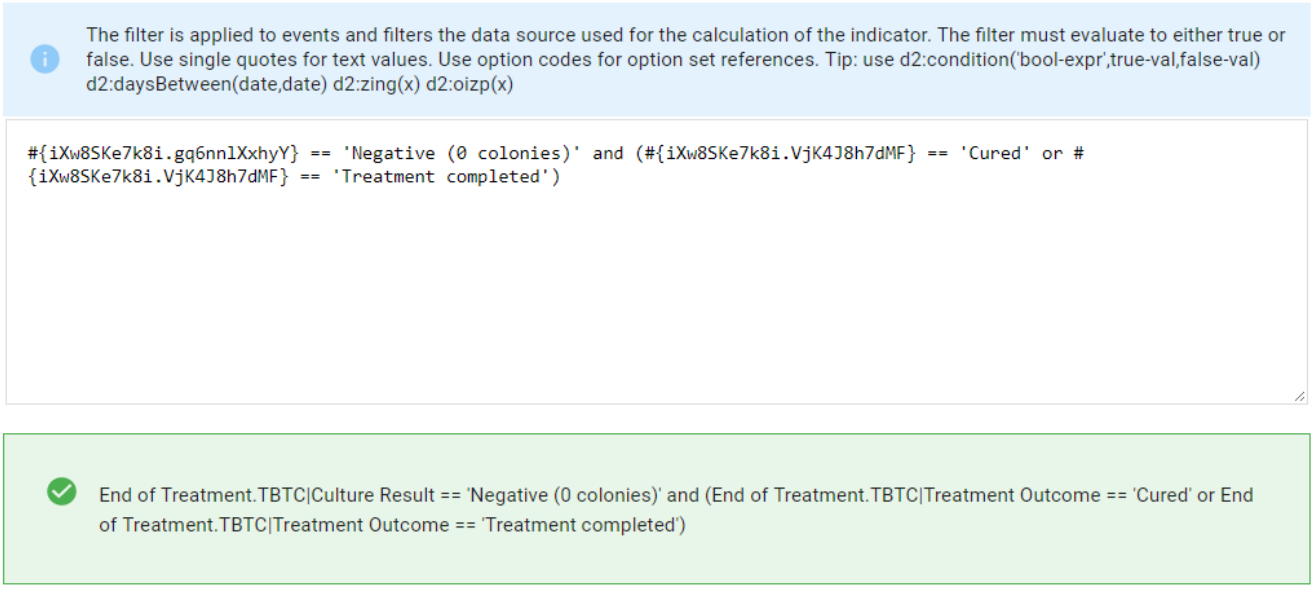


We are now going to create our criteria which will filter out the events required (culture result is negative and the treatment outcome is either cured or completed).

When we set criteria within a filter using option sets, we must use the option code. The option code may be different than the name, We will have to set three criteria using the available data elements from the program:

- Culture Result == 'Negative (0 colonies)' and
- Treatment Outcome == 'Cured' or Treatment Outcome == 'Treatment completed'

You can select the data elements from the right side menu as before. In the filter box, you will see the programuid.dataelementuid as in the expression. Underneath in the green box, you will see this represented in plain text which is easier to decipher.

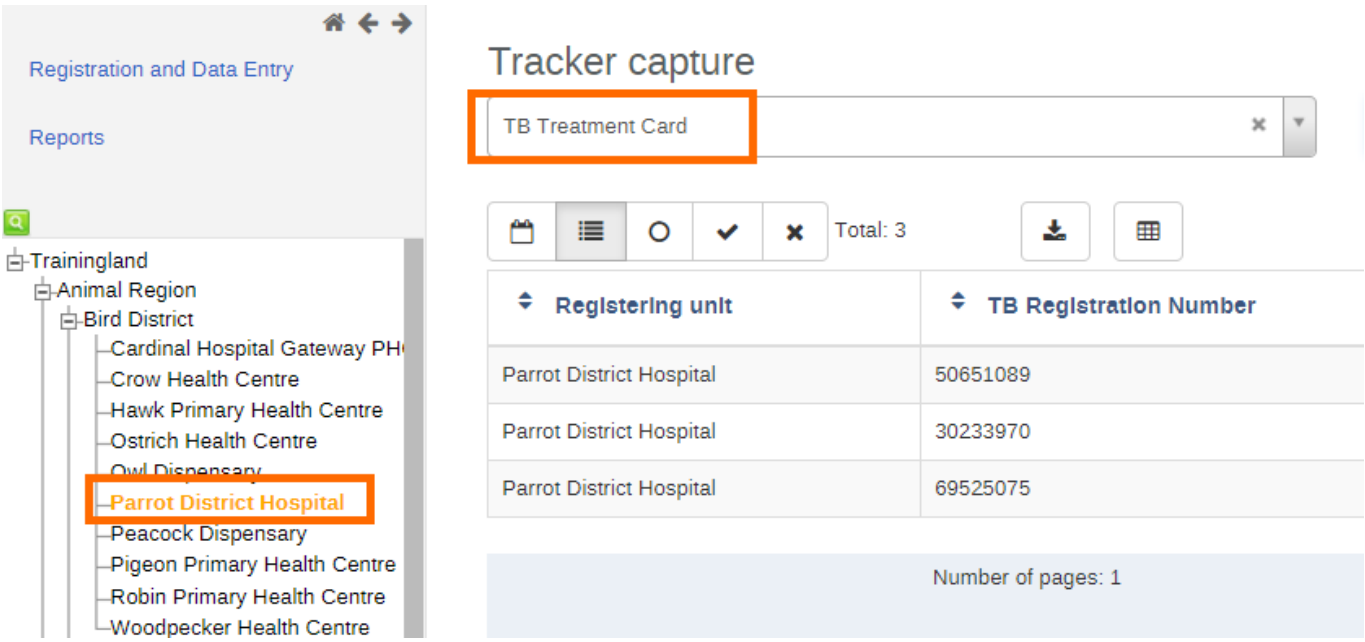


Notice how the **or** condition is contained within brackets. This is required to ensure the filter runs properly. Note that if you are grouping multiple and/or conditions together to create a specific filter criteria, then you will need to use brackets. Save the indicator after you have entered and explained the filter.

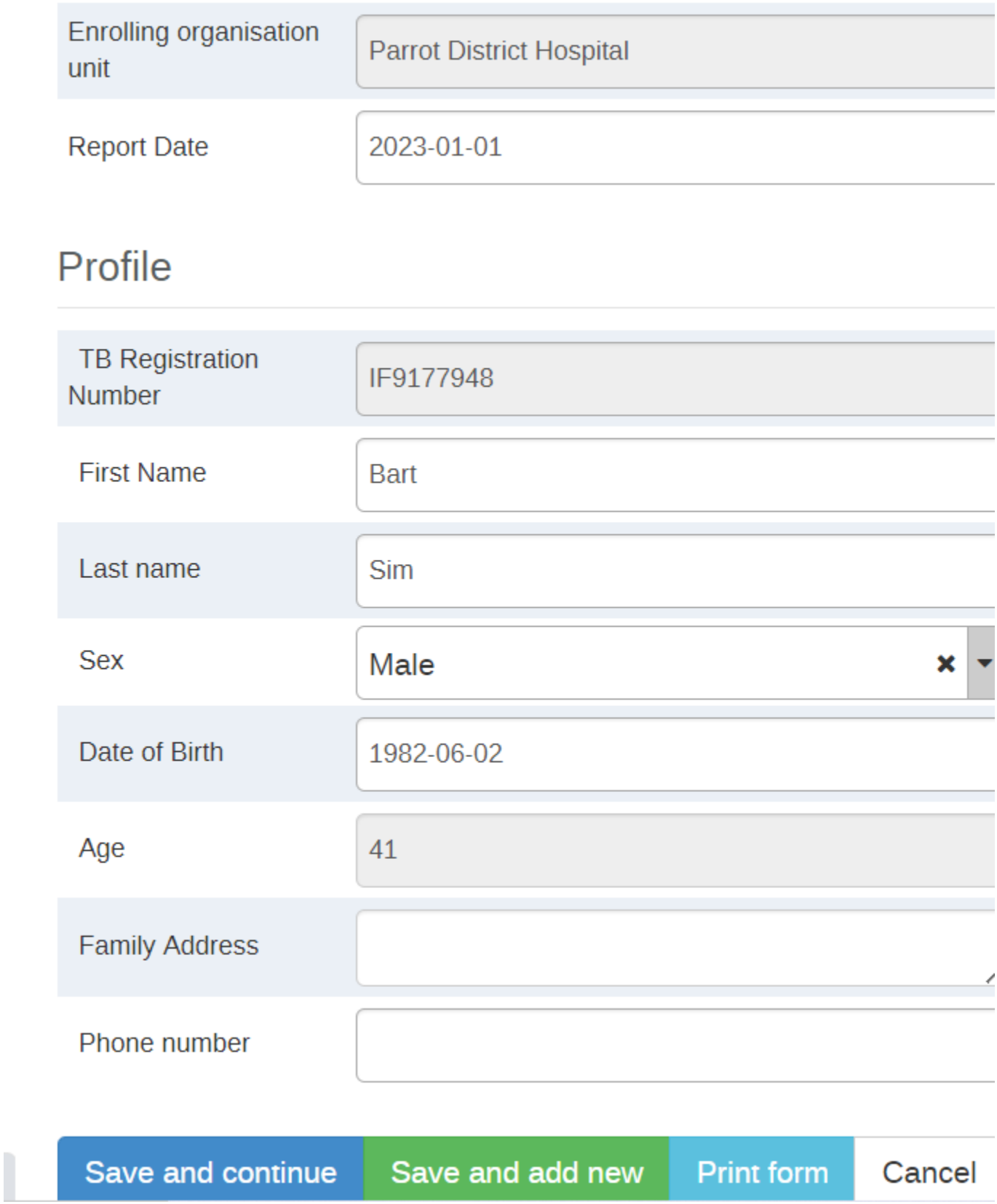
Test the program indicator

Navigate to tracker capture in this case to test the program indicator. Clear your cache if you have accessed the program already.

Select any Facility that has the TB Treatment Card program.

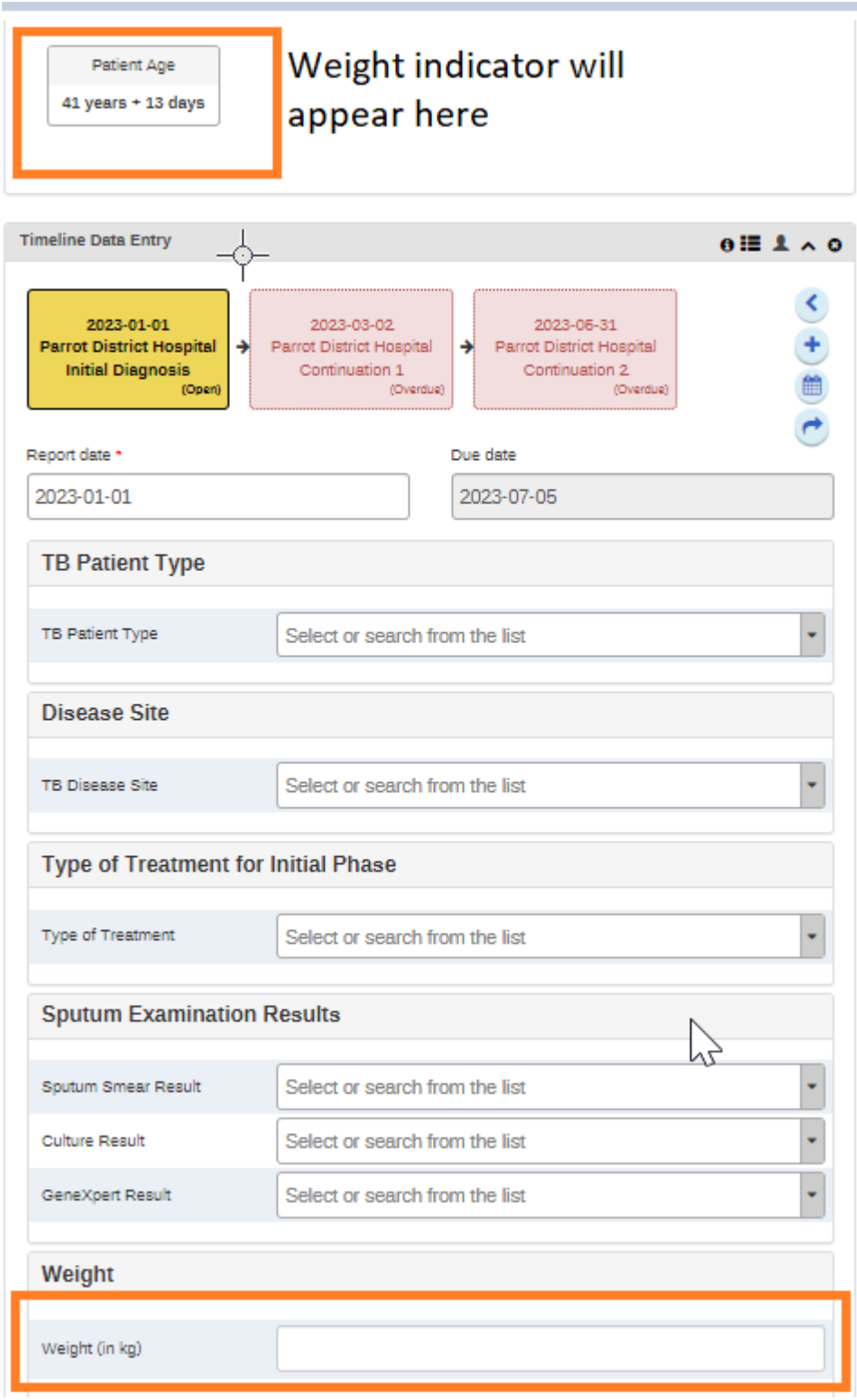


Proceed to register a new TEI. Click on Save and continue when the details are entered. You may want to select a report date that is ~5-6 months back from the current date as this is the average difference between the initial diagnosis and end of treatment stages.

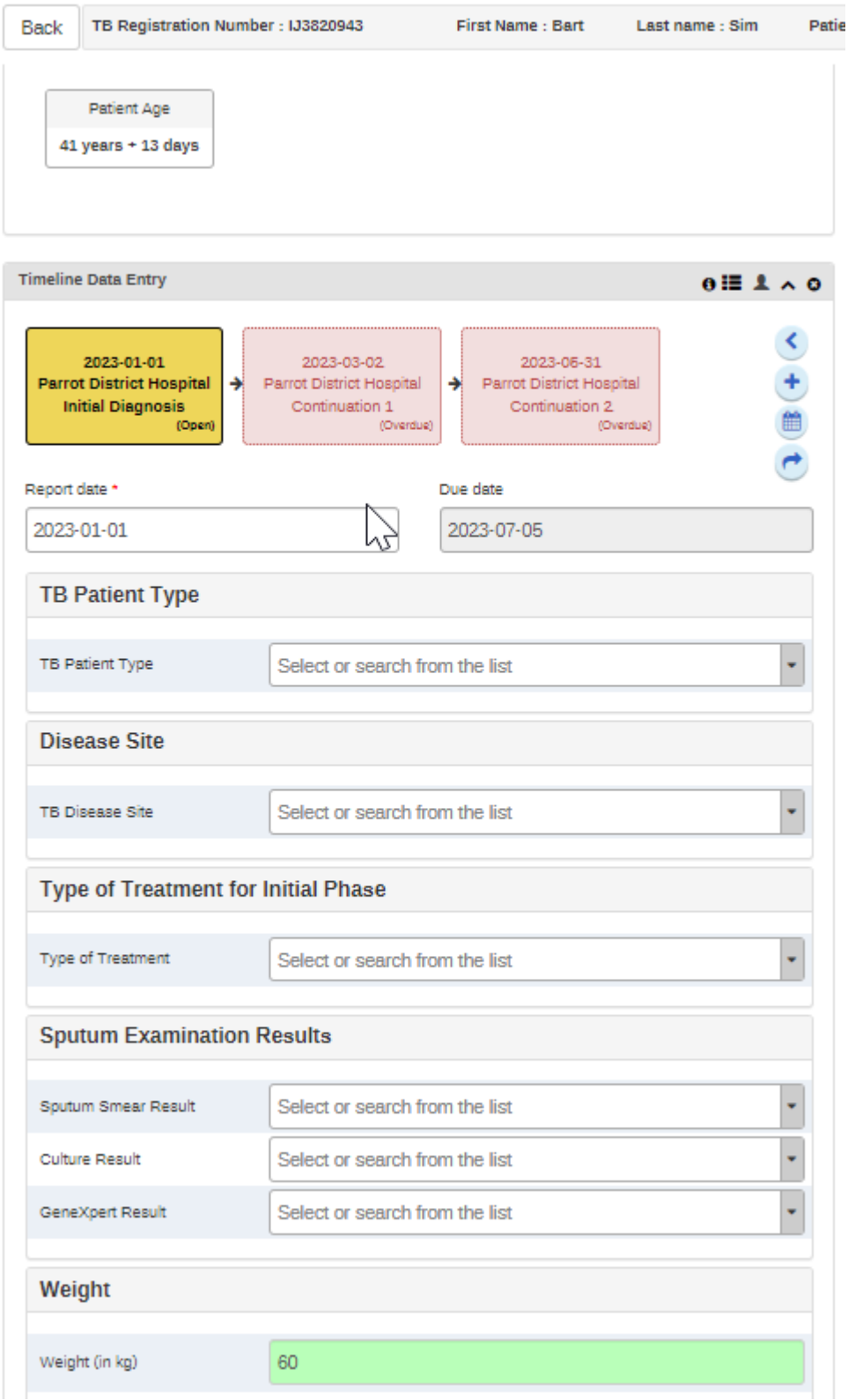


In the tracker dashboard, you will see a space for indicators as well as the timeline data entry. The weight indicator will appear when you the filter meets your criteria that was set earlier

- Culture Result == 'Negative (0 colonies)' and
- Treatment Outcome == 'Cured' or Treatment Outcome == 'Treatment completed'

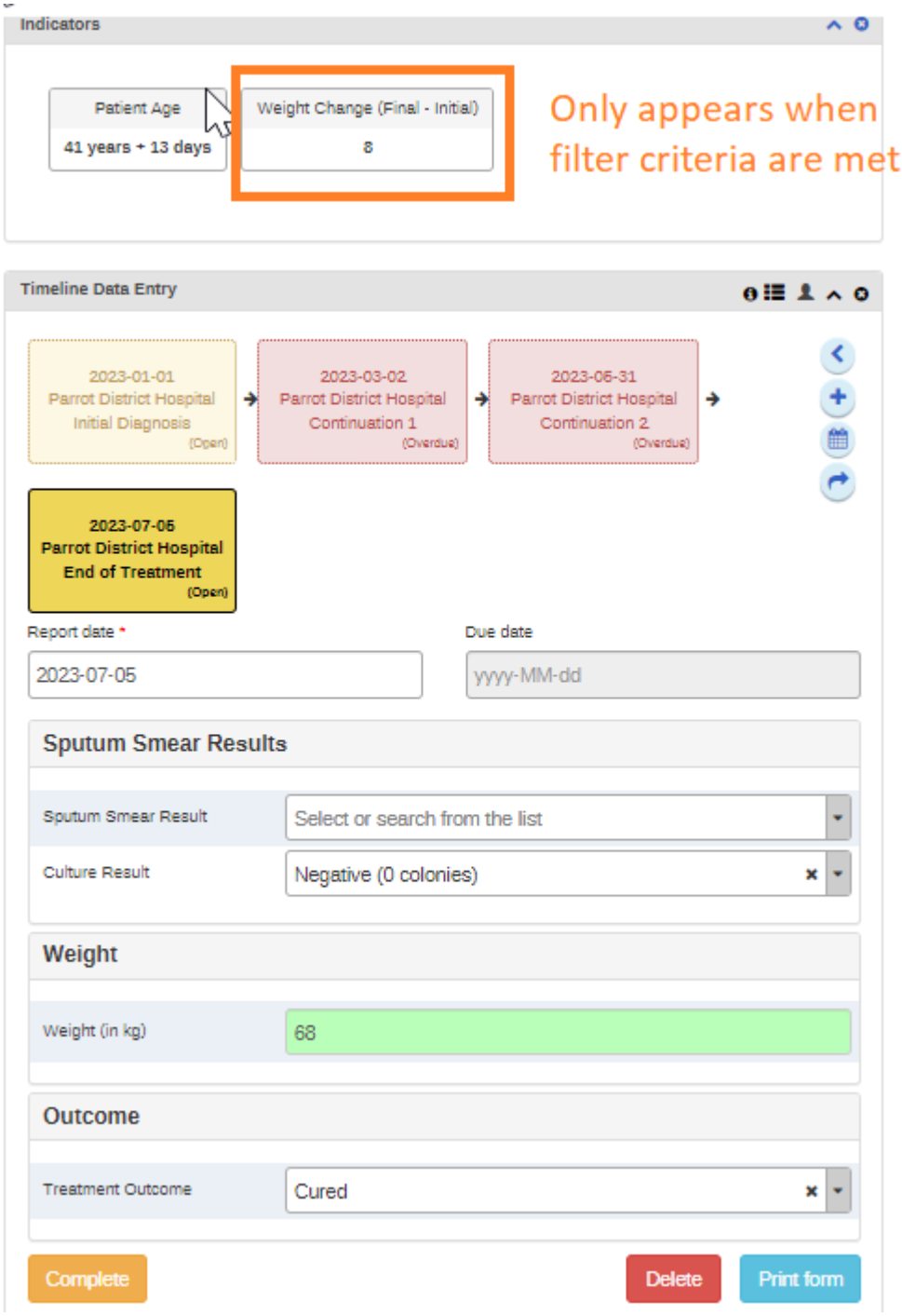


To get started enter a weight value in the **Initial Diagnosis** stage



Than add an event for the end of treatment stage

Enter a weight value, select **negative **as the_ **culture result**_ and select either **Cured** or **Treatment completed** as the ***treatment outcome***. Note to the participants that the weight indicator does not appear unless these criteria are met.



Creating Combined Indicators

Exercise 6 - Indicator 6 : TB Incidence rate per 100,000

Here we can take program indicators and combine them with aggregate data elements to make indicators as required. We do this by using the regular indicators app.

Conceptualize the indicator

We want to calculate the TB incidence rate per 100,000 population. This is equal to:

(The number of new TB cases/Total Population) * 100, 000

If we break this down,

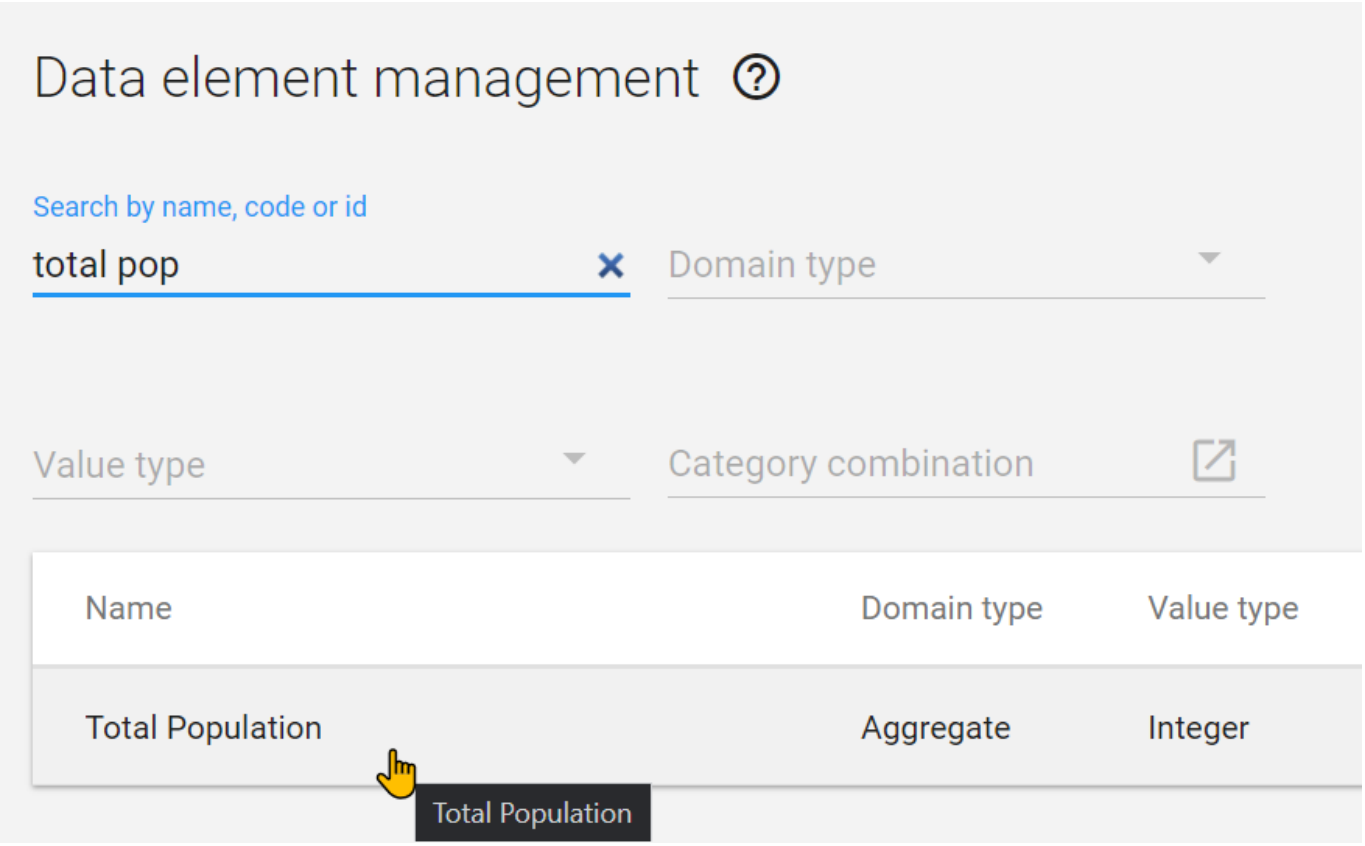
1. We can retrieve the number of new TB cases from our TB treatment card program. We need to create a program indicator to retrieve this total
2. The total population is an aggregate data element that we might import into DHIS2 from a census or other estimation survey
3. We multiply the divided values by 100,000 to calculate our incidence rate

Review the program indicator

A program indicator, TB new cases, has already been created as part of this demonstration. You can review it quickly to see the aggregation type, expression and filter.

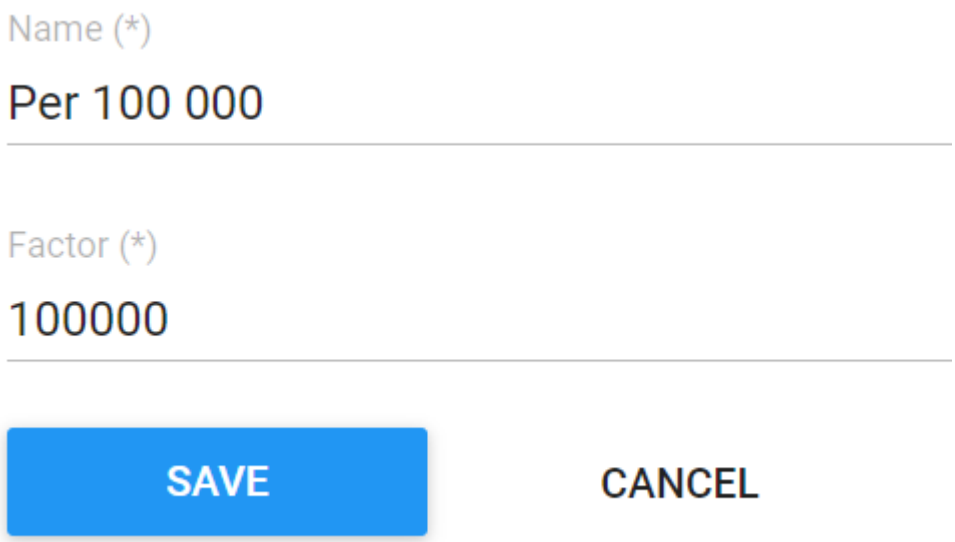
Review the denominator

We can use the data element “Total Population” as our denominator. This already exists as a data element in our system and also already has data within it.



Review the indicator type

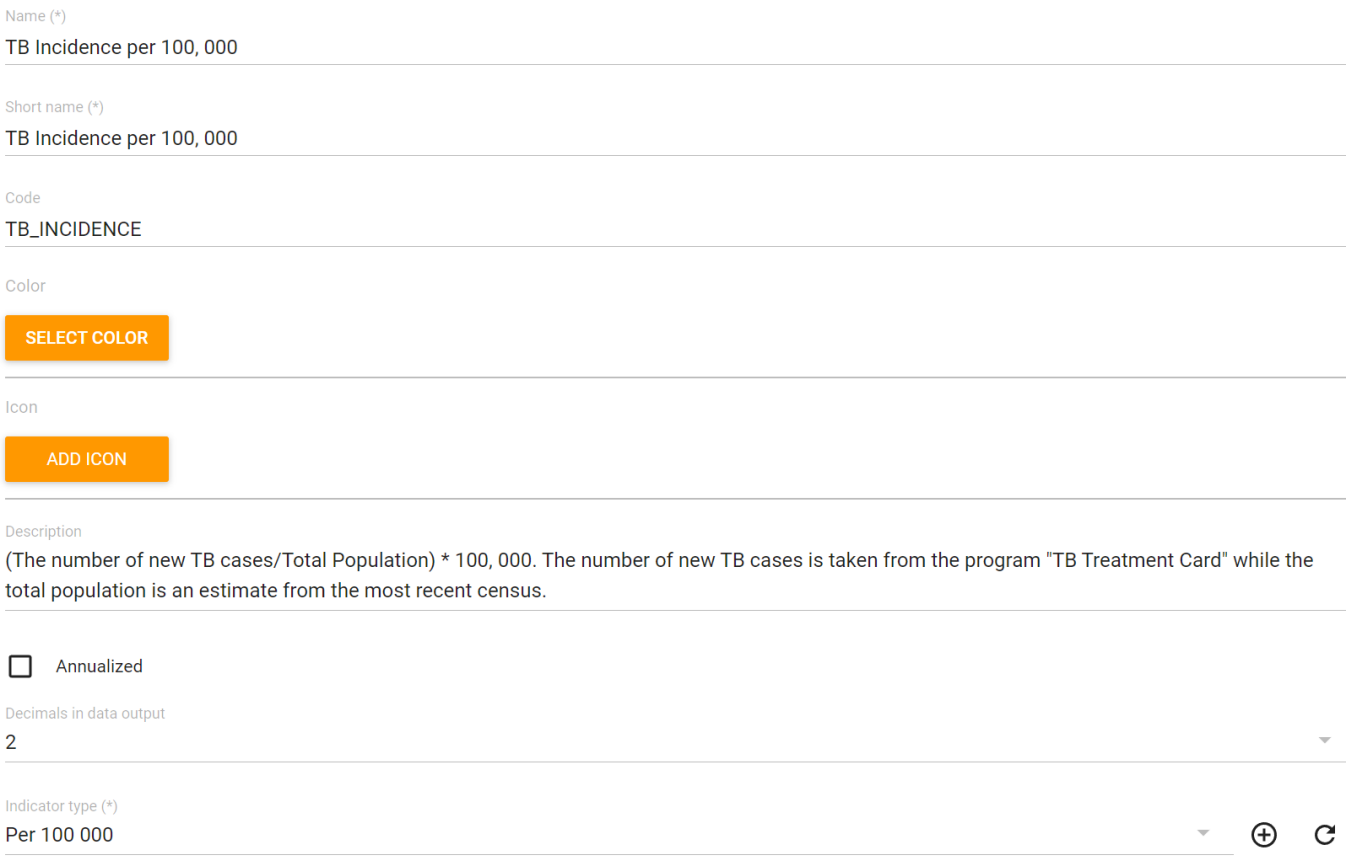
We want to create an indicator with a factor of 100,000. This already exists in our system and we can use it when we build our indicator.



Create a new indicator

Navigate to the indicator management page (Maintenance -> Indicator) and proceed to create a new indicator.

Add in the details of your indicator



Here is an example description:

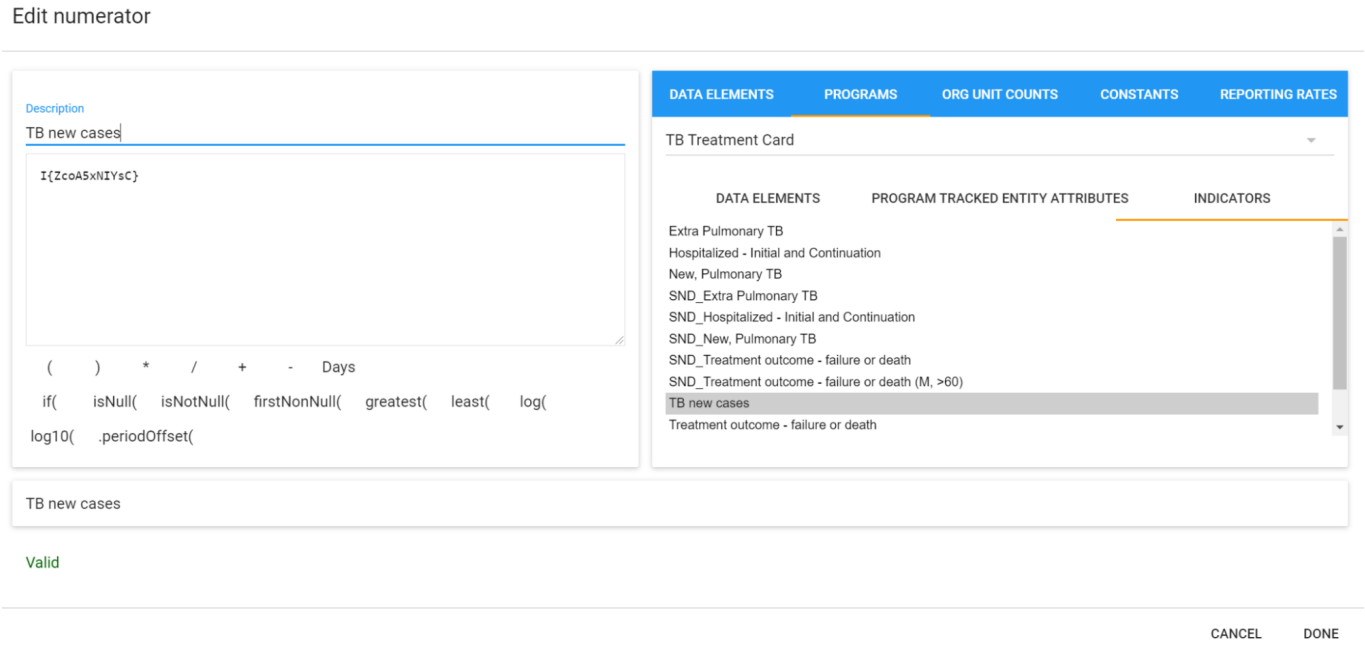
(The number of new TB cases/Total Population) * 100, 000. The number of new TB cases is taken from the program "TB Treatment Card" while the total population is an estimate from the most recent census.

Edit the numerator

I am able to select program indicators as a source here in the indicator management page.

Select

1. Programs
2. TB Treatment Card
3. Indicators
4. The indicator TB new cases
5. Enter a description
6. Save



Edit the denominator

Select

7. Data Elements
8. The data element Total Population
9. Enter a description
10. Save

Save the indicator before proceeding

Take a small break and notify the instructor you made your indicator. You won't be able to see the output yet, the instructor will explain.

Verify the indicator in data visualizer

Create a pivot table with the inputs:

1. Data:
    1. TB new cases (program indicator from TB treatment card)

2. Total population (data element)
3. TB Incidence per 100,000 (the indicator you just made)

2. Period : Last year
3. Org unit : Trainingland

Trainingland			
	TB new cases	Total Population	TB incidence per 100,000
2023	1 709	10 927 273	15.64

You can verify the calculation manually and see if the result is correct!