



Introduction to Atlas

INTERFACE AND COHORT BUILDING

CHDI

Montefiore Einstein
**CENTER FOR HEALTH
DATA INNOVATIONS**

Introduction to Atlas: Interface and Cohort Building

What is ATLAS?

ATLAS is a free, publicly available, web-based tool developed by the OHDSI community that facilitates the design and execution of analyses on standardized, patient-level, observational data in the Common Data Model (CDM) format.

ATLAS is deployed as a web application in combination with the OHDSI WebAPI. Performing real-time analyses requires access to patient-level data in the CDM. In order to run Atlas, you must be behind Montefiore's firewall.

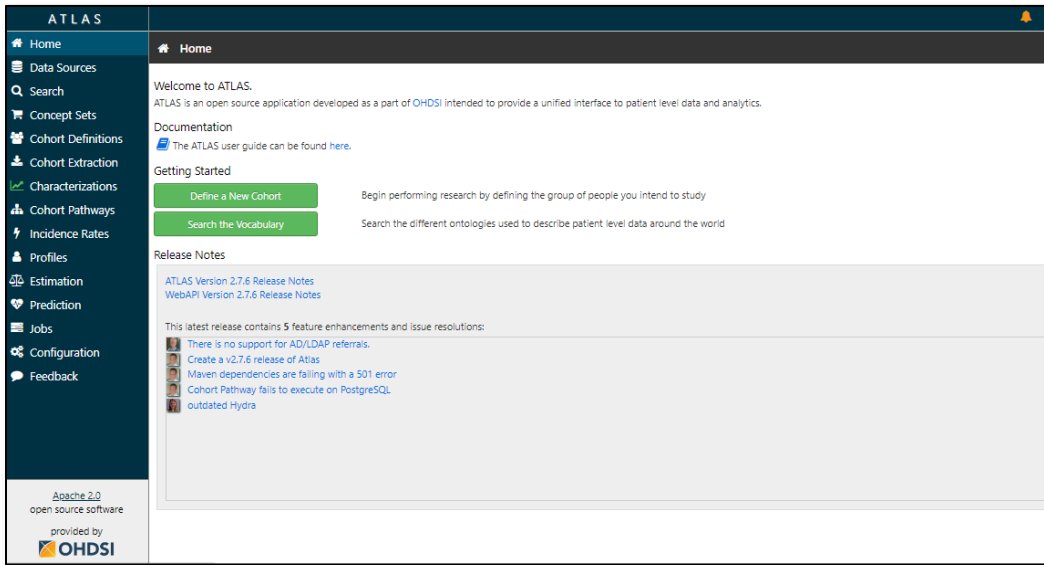
Each unique user will register for a profile through the ICTR portal:

<https://informatics34.einsteinmed.org/ICTR-SR/Default.aspx>

- at the bottom select Biomedical Informatics (Atlas, Redcap, etc.)
- on the next page select Atlas

To reach Montefiore's Atlas instance: <https://chdi.montefiore.org/atlas/>

Welcome to Atlas!



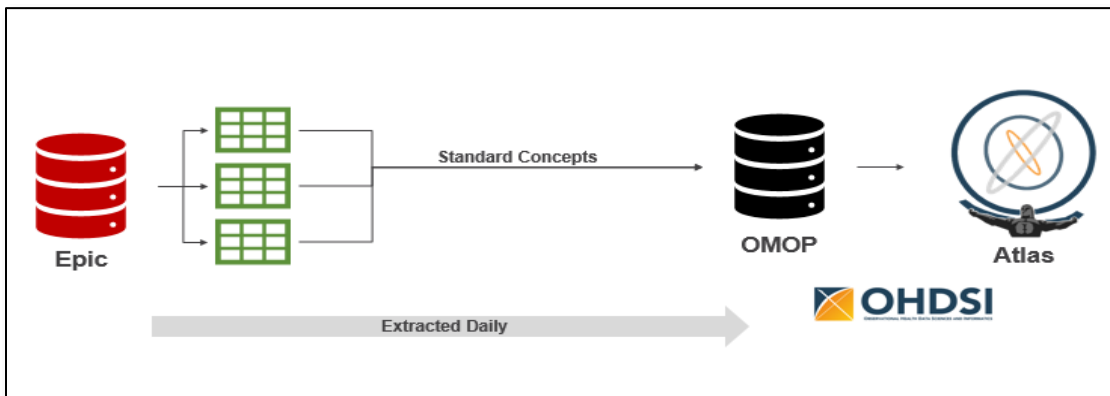
What is the OMOP Common Data Model [CDM]?

The OMOP Common Data Model allows for the systematic analysis of disparate observational databases. The concept behind this approach is to transform data contained within those databases into a common format (data model) as well as a common representation (terminologies, vocabularies, coding schemes), and then perform systematic analyses using a library of standard analytic routines that have been written based on the common format. This ensures easy sharing of concepts, so that everyone speaks the same common “language” when querying data.

In order to create queries, the user must understand how to build cohorts and the components that are a part of every new cohort built.

We discuss these necessary components below.

How Atlas gets its information



The OMOP-CDM at Montefiore converts data from any database into a standard concept. It takes that standard concept and locates it on OMOP. Then, Atlas as an analytical tool consumes that standard concept to do standardized and systematic analyses.

Background

Concept set

In atlas, the content of EHRs are identified by concepts which are derived/represented from standard vocabularies such as [SNOMED, ICD, LOINC, RXNorm]. A concept is a term that belongs to a domain and may exist in relation to other concepts. Concepts are CDM-specific entities that represent clinical information across atlas. With concepts you can access any event available on OMOP-CDM which exists on domain tables [visits, procedures, conditions, drug/device exposures, measurements]. The concepts are restricted to the domains. For example, the information in the measurement domain contains only information about measurement [value, date, etc.] but no information about the condition [diagnoses, sign, symptoms] and visits [visit lengths, visit types]. the concepts above a given concept are referred to as ancestors and those below and descendants this is referenced as hierarchy in atlas. In Atlas some attributes are domain specific and some are concept specific. Concepts are CDM-specific entities that help defining the clinical events using Atlas.

The look of concept sets:

As we work through our exercises, we will demonstrate what the user should see on the interface. We will begin by creating a concept set for Type 2 diabetes. Below you see a list of concepts available currently on Atlas. Later, will define a population of diabetics.

Let's look at the terms which we have defined so far.

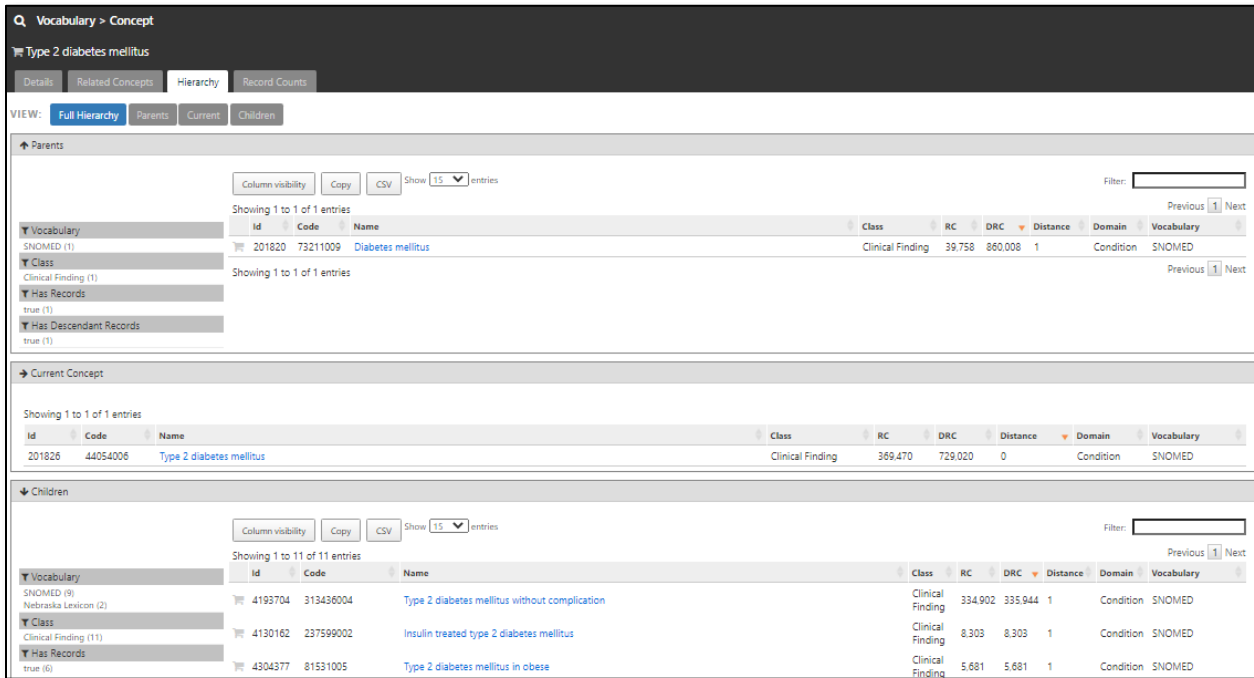
The screenshot shows the Atlas interface for a search on 'Type 2 Diabetes Mellitus'. The search results are displayed in a table with the following columns: Id, Code, Name, Class, RC, DRC, Domain, and Vocabulary. The DRC column is highlighted with a red box. The table shows three entries:

Id	Code	Name	Class	RC	DRC	Domain	Vocabulary
443732	422014003	Disorder due to type 2 diabetes mellitus	Clinical Finding	10	92,403	Condition	SNOMED
443733	422099009	Disorder of eye with type 2 diabetes mellitus	Clinical Finding	9,800	24,269	Condition	SNOMED
376065	421326000	Neurological disorder with type 2 diabetes mellitus	Clinical Finding	4,975	22,386	Condition	SNOMED

- **Domains:** A domain is a set of allowable concepts for standardized modeling. These domains are derived from standardized medical vocabulary [condition, drug, procedure, visit, device, specimen, observation]. We usually think about a data domain in terms of the event a patient experience.
- **Standard concepts:** Standard concepts designated in blue color are used to represent the clinical events. The standardization is mapped through medical vocabularies such as [SNOMED, LOINC, and RXNorm]
- **Descendent record count (DRC):** DRC is the list of progenies of the main concept that we are looking at.



- **Hierarchy:** In atlas concepts have hierarchical relationships. The concepts above a given concept are referred to as ancestors and those below and descendants with a vertical 'is a' relationship.



- **Vocabulary:** standard vocabularies are specifically designed to accommodate all different medical events and terminologies.

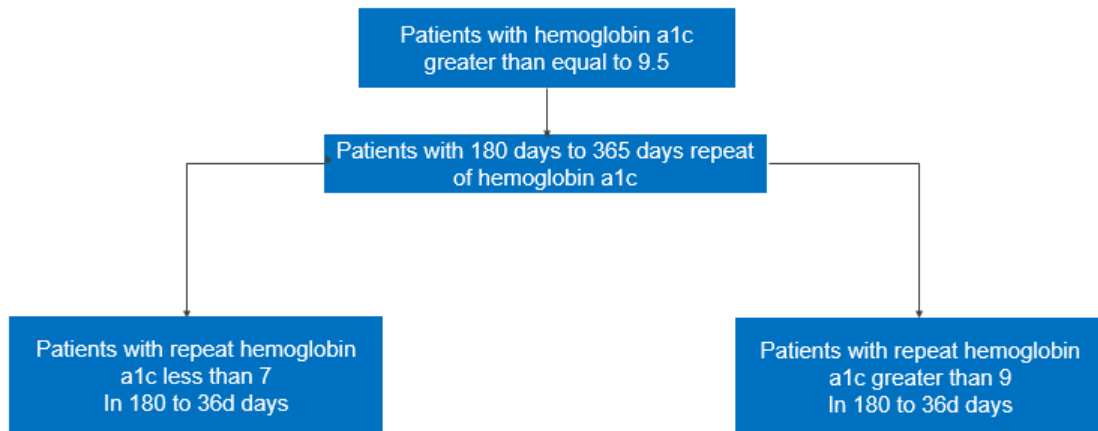
Now let's get to the exercise:

We want to find diabetic patients, so we need concept sets such as hemoglobin a1c to build our cohort.

Practice Exercise: Diabetes at Montefiore

1. Create a cohort of the *earliest* HgbA1c greater than or equal to 9.5 in a defined time period (01-01-2018 until 31-12-2018)
 - Report characteristics
2. Find from the same population those who had a diagnosis of Diabetes mellitus for the same defined period 01-01-2108 to 31-12-2018
 - Report characteristics
3. Then, of the patients who had a HgbA1c test greater than 9.5, find those who reduced their HgbA1c to achieve good control, or those who remained uncontrolled, as determined by their HgbA1c 6 months to one year later
 - Report characteristics

Diagram of step 3



Introduction to concept and cohort definition

Imagine a situation where you want to find a group of patients who have diabetes. You might want to find them through a lab test measurement of Hemoglobin a1c [LOINC] or through their diagnosis as a condition [SNOMED] or by the insulin administered to them as their medication or drug exposure [RXNorm] in inpatient or outpatient setting [visit].

All these different examples of clinical events are expressed as concepts in Atlas. Concepts are the building blocks for cohort creation, and you have to use concepts to define and qualify patients who would belong to each cohort. For example, as we said, you would search and create a concept for a measurement of hemoglobin a1c greater than 6.5 as a lab test or use insulin medication to find qualifying criterion for diabetic. Alternatively, you could identify your diabetic cohort by a diagnosis as condition while you would have to create a concept or set of concepts by diagnosis to qualify diabetic patients.

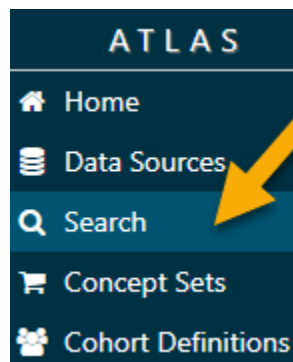
Once you have created the concepts that you will need to qualify your cohort, then you can use them to build your cohort and identify the group of patients you would want to study.

Let's start our exercise:

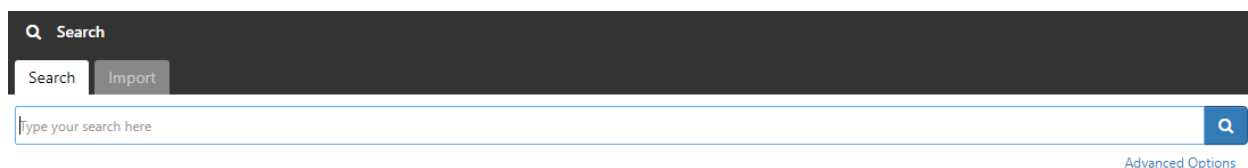
The first step is to find patients in 2018 with awful diabetes defined as having a hemoglobin a1c greater than equal to 9.5. In our case scenario we need to search a concept of measurement for hemoglobin a1c and then we will add the measurement criteria of value greater than 9.5 as we build our cohort to qualify awful diabetic.

Let's find the hemoglobin a1c measurement.

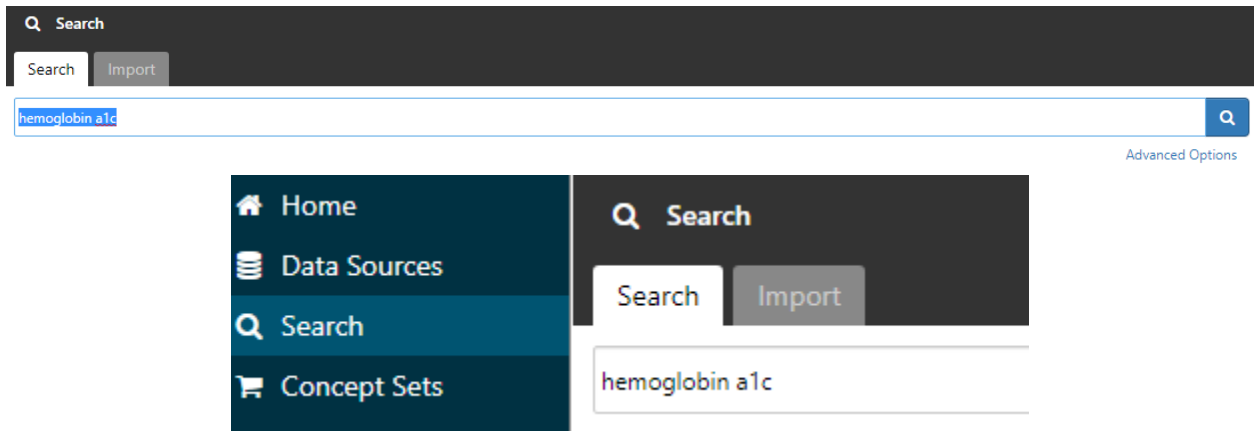
1. From atlas navigation tab click on search.



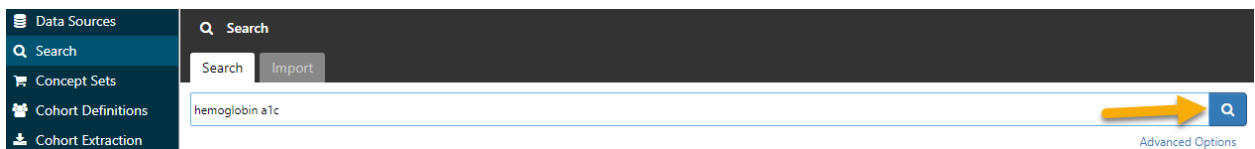
2. A new window opens, giving you a chance to search for hemoglobin a1c.



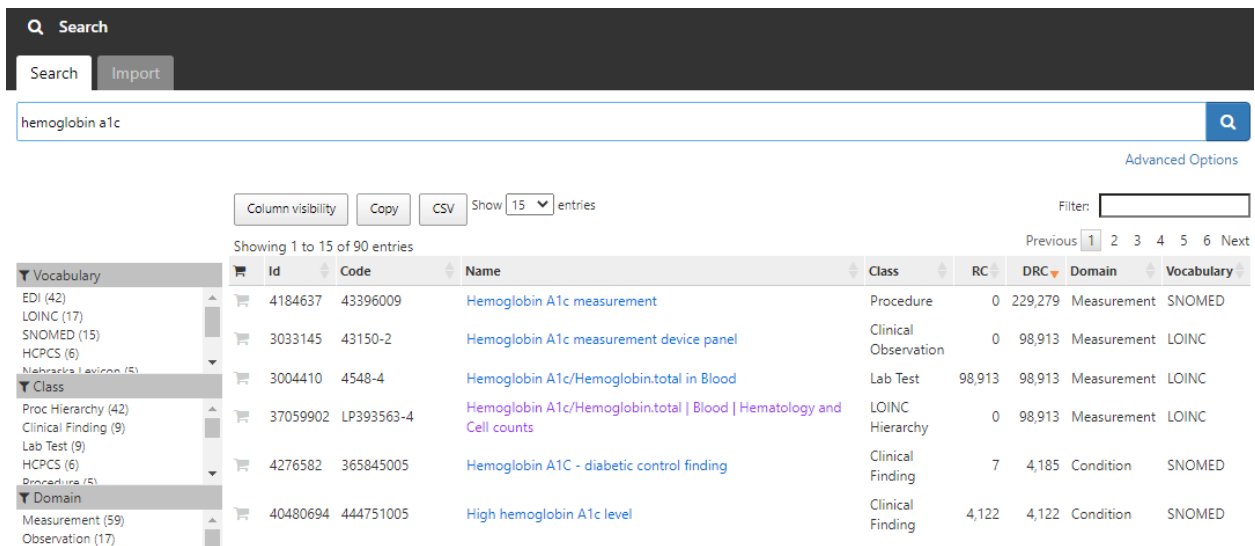
- In the bar type hemoglobin a1c.



- Left click on the magnifying glass icon on the right.



- A list of concepts related to hemoglobin a1c will appear on the screen. We notice the largest number of results as 98,913 is probably the laboratory test that we want to use.



- Take a closer look at the list. On the third concept listed, when we look at **class** and **domain**, we unsurprisingly see **class= lab test** and **domain= measurement**.

hemoglobin a1c

Advanced Options

Column visibility Copy CSV Show 15 entries Filter:

Showing 1 to 15 of 90 entries Previous 1 2 3 4 5 6 Next

Vocabulary	Id	Code	Name	Class	RC	DRC	Domain	Vocabulary
EDIC (42)	4184637	43396009	Hemoglobin A1c measurement	Procedure	0	229,279	Measurement	SNOMED
LOINC (17)	3033145	43150-2	Hemoglobin A1c measurement device panel	Clinical Observation	0	98,913	Measurement	LOINC
SNOMED (15)	3004410	4548-4	Hemoglobin A1c/Hemoglobin.total in Blood	Lab Test	98,913	98,913	Measurement	LOINC
HCPCS (6)	37059902	LP393563-4	Hemoglobin A1c/Hemoglobin.total Blood Hematology and Cell counts	LOINC Hierarchy	0	98,913	Measurement	LOINC
NAHSRCSA Lexicon (5)	4276582	365845005	Hemoglobin A1C - diabetic control finding	Clinical Finding	7	4,185	Condition	SNOMED
Proc Hierarchy (42)	40480694	444751005	High hemoglobin A1c level	Clinical Finding	4,122	4,122	Condition	SNOMED
Clinical Finding (9)								
Lab Test (9)								
HCPCS (6)								
Procedure (5)								
Domain								
Measurement (59)								
Observation (17)								

7. Choose this item

Search

Search Import

hemoglobin a1c

Advanced Options

Column visibility Copy CSV Show 15 entries Filter:

Showing 1 to 15 of 90 entries Previous 1 2 3 4 5 6 Next

Vocabulary	Id	Code	Name	Class	RC	DRC	Domain	Vocabulary
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NAHSRCSA Lexicon (5)								
Proc Hierarchy (42)								
Clinical Finding (9)								
Lab Test (9)								
HCPCS (6)								
Procedure (5)								
Domain								
Measurement (59)								
Observation (17)								

8. Click on the shopping cart beside the concept you want to choose.

Id	Code	Name
3004410	4548-4	Hemoglobin A1c/Hemoglobin.total in Blood

9. While clicking on the shopping card symbol, on the top left, the phrase ‘New concept set’ appears.

New Concept Set

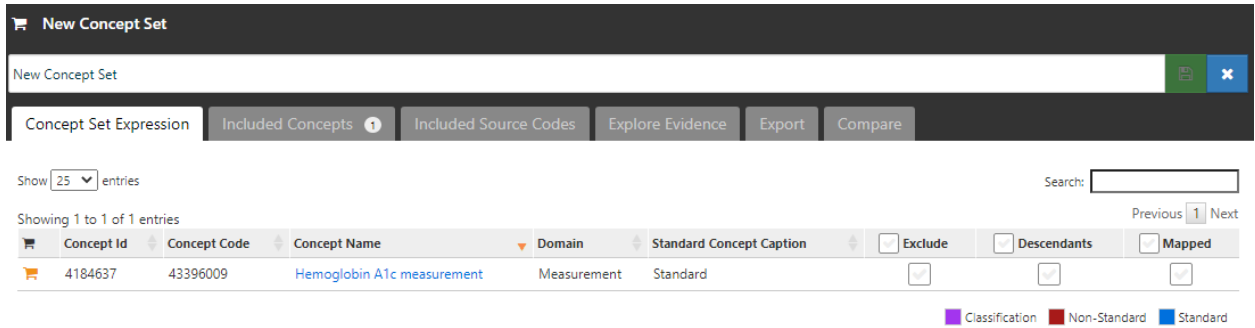
Search

Search Import

hemoglobin a1c

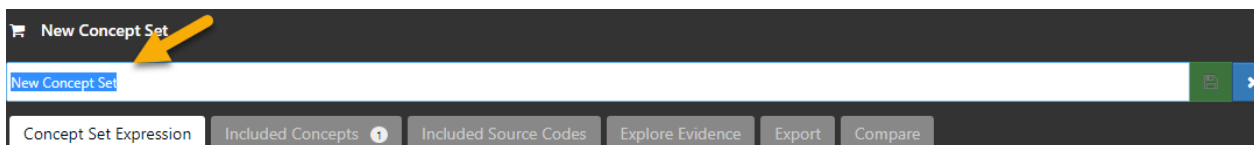
Advanced Options

10. Click on the phrase “New Concept Set”. This will clean up your screen leaving you only with the contents of your shopping cart.

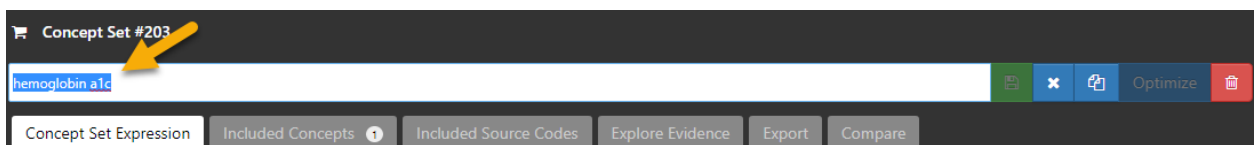



11. Now name the concept set you have chosen. Type in the word hgba1c with your first and last initial (ex:hgba1cKJ).

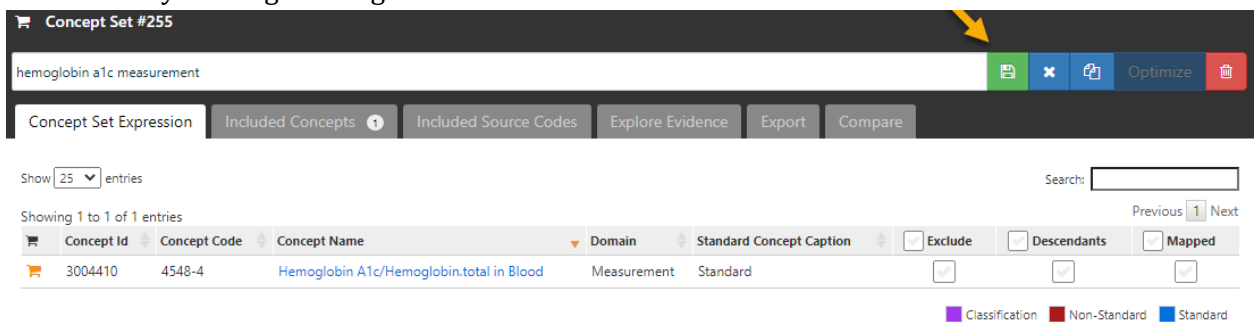
Unfortunately, there is only one library for everyone at Montefiore to use and you need a unique name. If your initial is taken type your 'FirstLastname' after hgba1c



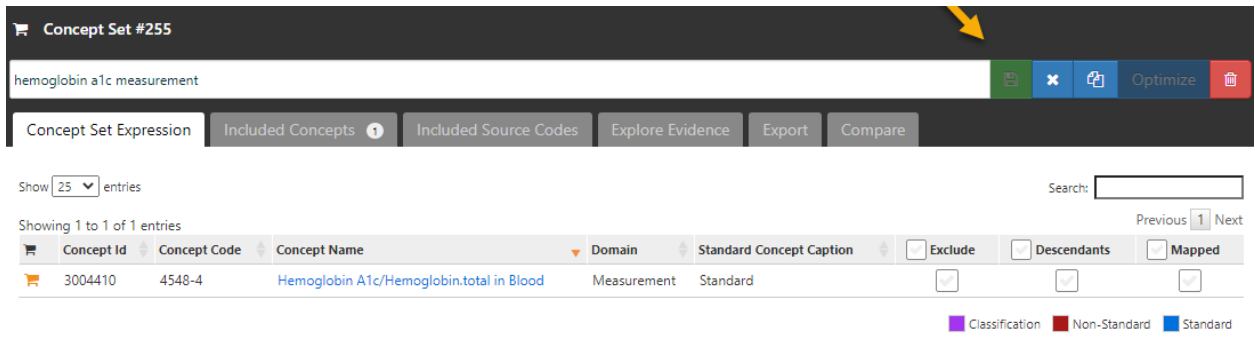
12. I have renamed it to hemoglobin a1c.



13. Now **Save** by clicking on the green  tab.



14. Once the save button changes color, you are ready to use this concept of hemoglobin a1c to build a cohort.



Concept Set #255

hemoglobin a1c measurement

Concept Set Expression Included Concepts (1) Included Source Codes Explore Evidence Export Compare

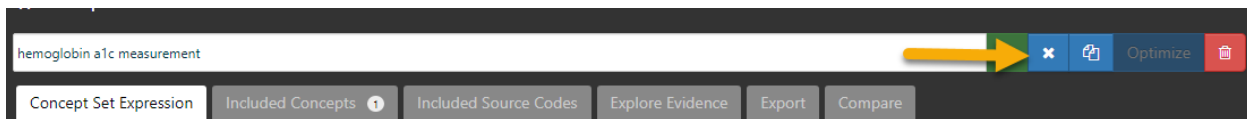
Show 25 entries Search: []

Showing 1 to 1 of 1 entries Previous 1 Next

Concept Id	Concept Code	Concept Name	Domain	Standard Concept Caption	Exclude	Descendants	Mapped
3004410	4548-4	Hemoglobin A1c/Hemoglobin.total in Blood	Measurement	Standard	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Classification Non-Standard Standard

15. Click on x button to complete the concept creation.



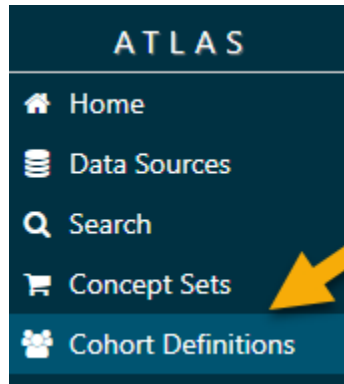
hemoglobin a1c measurement

Concept Set Expression Included Concepts (1) Included Source Codes Explore Evidence Export Compare

Now Let's build a cohort of awful diabetics.

Building a Cohort:

1. From the Atlas navigation tab click on the **cohort definition**.



2. A new window opens. On the top right click on the blue key **new cohort**.



3. This screen has several sections - we will take you through them step by step, piece by piece



4. Look at section 2, the **cohort entry event**.

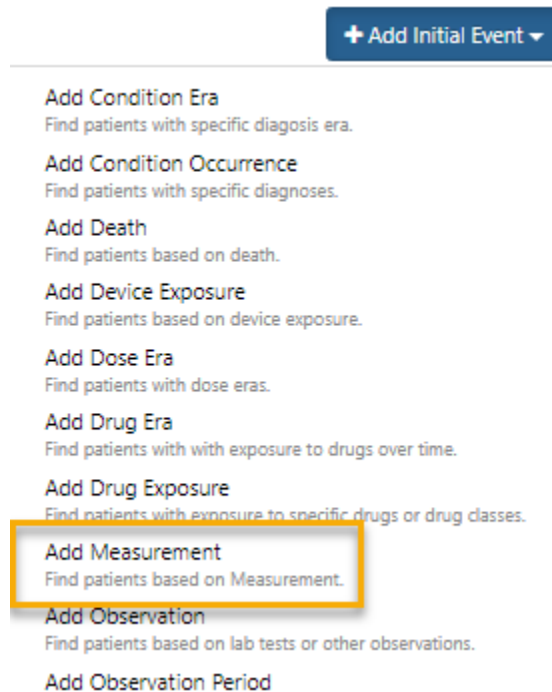
5. Click on “add initial event”

A new window opens, allowing you to choose concept sets to qualify your cohort members.

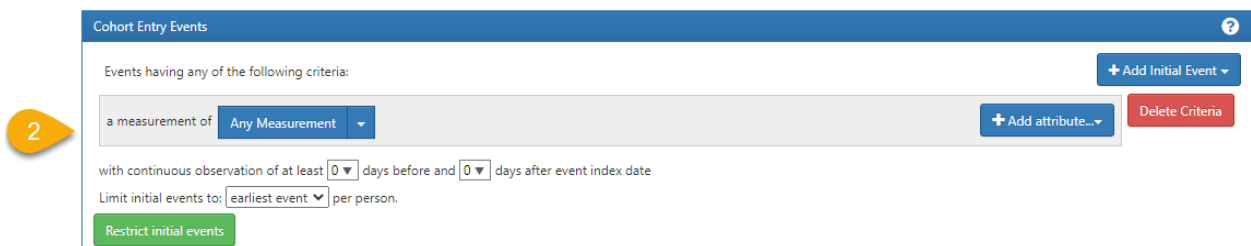
6. Which of these events do you think you need to get hemoglobin a1c?

- Add Condition Era**
Find patients with specific diagnosis era.
- Add Condition Occurrence**
Find patients with specific diagnoses.
- Add Death**
Find patients based on death.
- Add Device Exposure**
Find patients based on device exposure.
- Add Dose Era**
Find patients with dose eras.
- Add Drug Era**
Find patients with with exposure to drugs over time.
- Add Drug Exposure**
Find patients with exposure to specific drugs or drug classes.
- Add Measurement**
Find patients based on Measurement.
- Add Observation**
Find patients based on lab tests or other observations.
- Add Observation Period**
Find patients based on Observation Period.
- Add Payer Plan Period**

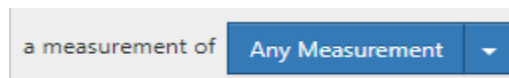
7. Answer: select **Add Measurement**. Which would be any saved concept for laboratory test.




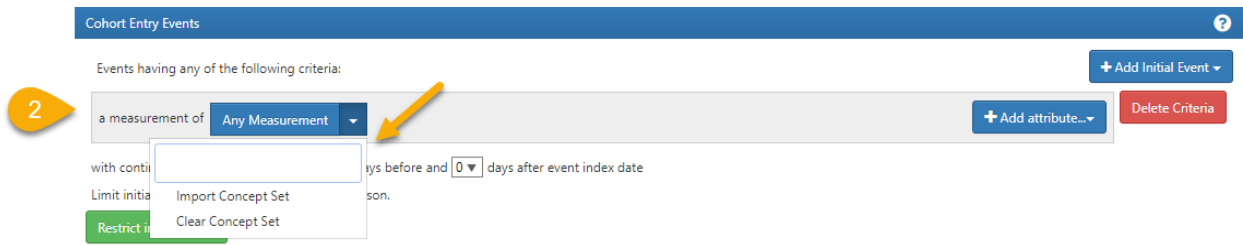
8. A window opens that says any measurement.



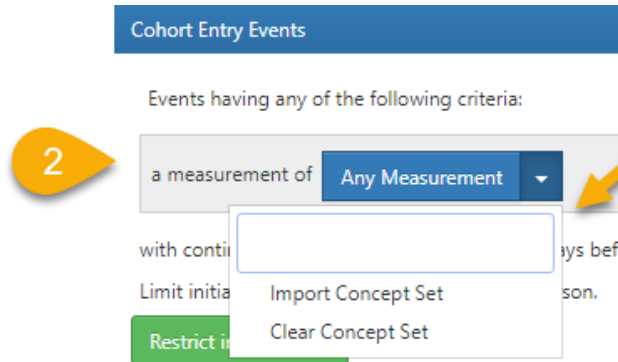
9. Pay attention to **Any Measurement** drop down.



10. Click on the icon  a new tab opens up allowing you to access any prebuilt concepts.



11. Click on **Import concept set**.



12. A list of available concepts will appear (below). Choose **hemoglobin a1c measurement**.

Concept Sets

List Export

Show 10 entries Filter Repository Con

ID	Title	Created	Modified
255	hemoglobin a1c measurement	11/04/2020 1:57 PM	11/04/2020 1:57 PM
254	Enoxaparin	11/03/2020 4:28 PM	11/03/2020 4:32 PM
252	headache	10/28/2020 2:49 PM	10/29/2020 1:10 PM
253	mscheinfect head	10/28/2020 2:55 PM	10/28/2020 2:55 PM
251	hypertension	10/27/2020 4:51 PM	10/27/2020 4:58 PM
248	acetaminophen	10/26/2020 6:17 PM	10/26/2020 6:17 PM
247	COVID Positive Patients	10/26/2020 1:10 PM	10/26/2020 1:10 PM
246	ischemic heart disease	10/23/2020 12:49 PM	10/23/2020 12:49 PM
245	MGs Covid Lab Tests	10/23/2020 10:35 AM	10/23/2020 10:38 AM
244	Newborn Admissions	10/21/2020 3:42 PM	10/21/2020 3:42 PM

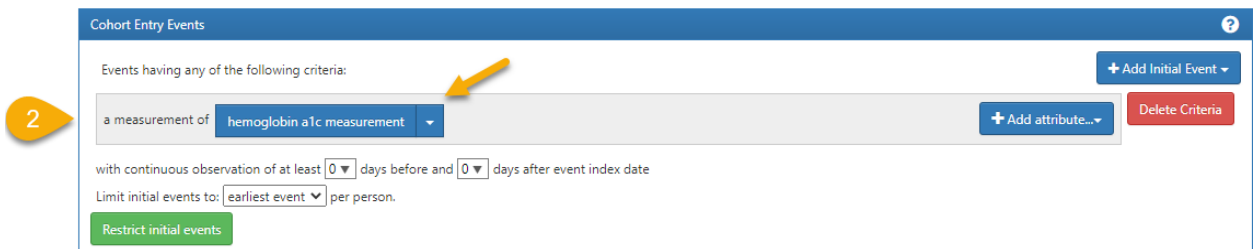
Showing 41 to 50 of 239 entries P1

Note, you are seeing many more concepts than you have created. This is due to the fact that all users in Atlas contribute and share a common library of concepts. You cannot alter someone else's concept, but you can use it.

Fortunately, Atlas always puts at the top the most recently created concept which is the one you just built.

13. Click on the hemoglobin a1c concept.

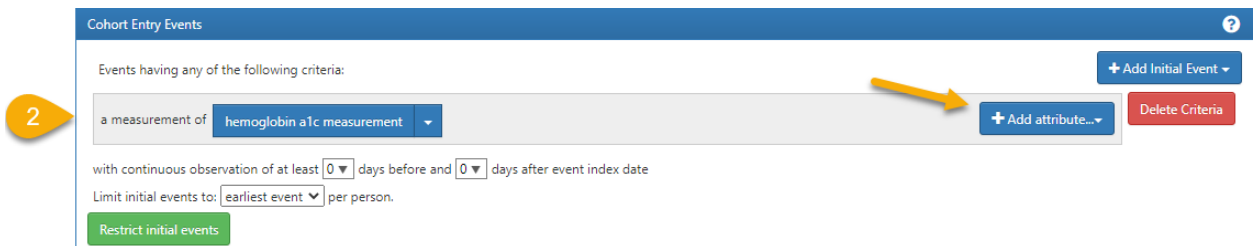
This will assign the concept of **hemoglobin a1c** to the **Any measurement** box and you will see this as in the image below.



14. So far, we have successfully chosen the primary event as a lab test for hemoglobin a1c.

15. Now we must specify the time that test was performed.

16. Since time when the lab test was drawn is an attribute of the lab test, and all attributes are selected by clicking on the **Add attribute** tab, this is what you must click.



17. A window opens up, allowing you to choose the attribute of interest.

18. Which of these attributes of interest will allow you to set the date of the lab test?

+ Add attribute...

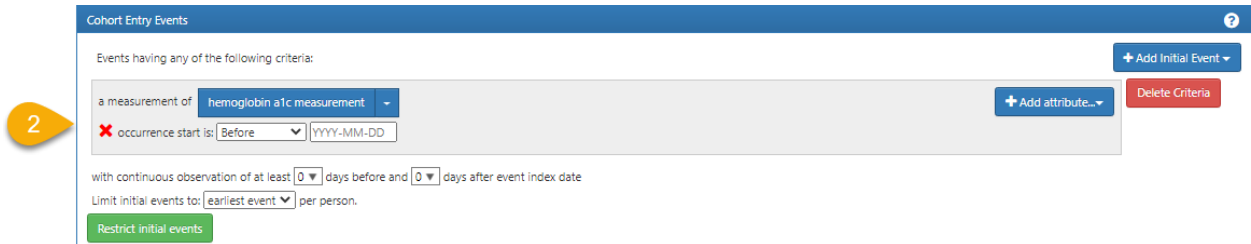
- Add First Measure Criteria**
Limit Measures to first occurrence in history.
- Add Age at Occurrence Criteria**
Filter Measurements by age at occurrence.
- Add Gender Criteria**
Filter Measurements based on Gender.
- Add Measurement Date Criteria**
Filter Measurements by Date.
- Add Measurement Type Criteria**
Filter Measurements by the Measurement Type.
- Add Visit Criteria**
Filter Measurements based on visit occurrence of measurement.
- Add Operator Criteria**
Filter Measurements by Operator.
- Add Value as Number Criteria**
Filter Measurements by Value as Number.
- Add Value as Concept Criteria**
Filter Measurements by Value as Concept.
- Add Unit Criteria**
Filter Measurements by the Unit.
- Add Abnormal Result Criteria**
Filter Measurements to include those which fall outside of normal range.
- Add Low Range Criteria**
Filter Measurements Low Range.
- Add High Range Criteria**
Filter Measurements by the Measurement Type.
- Add Low Range Ratio Criteria**
Filter Measurements by the Ratio of Value as Number to Range Low.
- Add High Range Ratio Criteria**
Filter Measurements by the Ratio of Value as Number to Range High.
- Add Provider Specialty Criteria**
Filter Measurements based on provider specialty.
- Add Measurement Source Concept Criteria**
Filter Measurements by the Measurement Source Concept.
- Add Nested Criteria...**
Apply criteria using the condition occurrence as the index date

19. Answer: **Add measurement date criteria**

+ Add attribute...

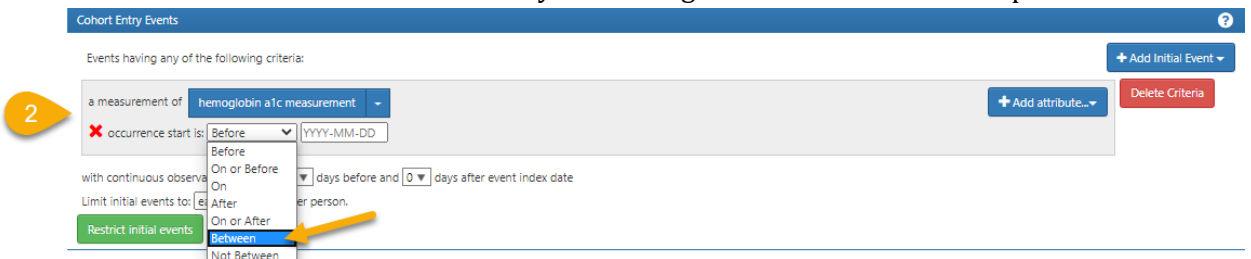
- Add First Measure Criteria**
Limit Measures to first occurrence in history.
- Add Age at Occurrence Criteria**
Filter Measurements by age at occurrence.
- Add Gender Criteria**
Filter Measurements based on Gender.
- Add Measurement Date Criteria**
Filter Measurements by Date.
- Add Measurement Type Criteria**
Filter Measurements by the Measurement Type.

20. Left click on the words “Add Measurement Date Criteria “. A new window opens up allowing you to set the interval of time during which the laboratory test was drawn.

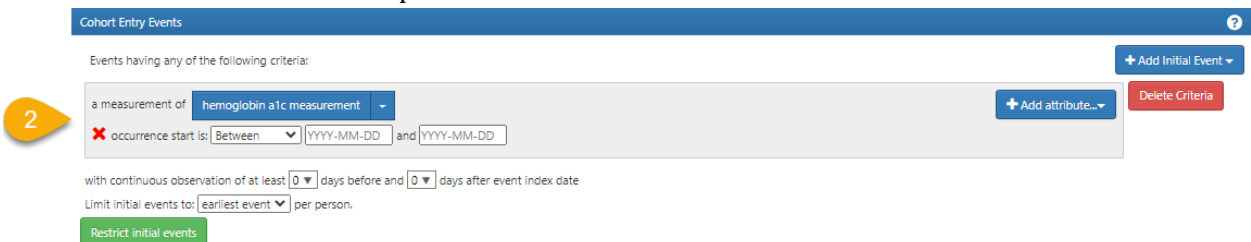


21. Now we are going to enter the time interval during which the lab test was drawn. However, we do not want to select a time before a date but rather an interval **between** which the laboratory test was performed.

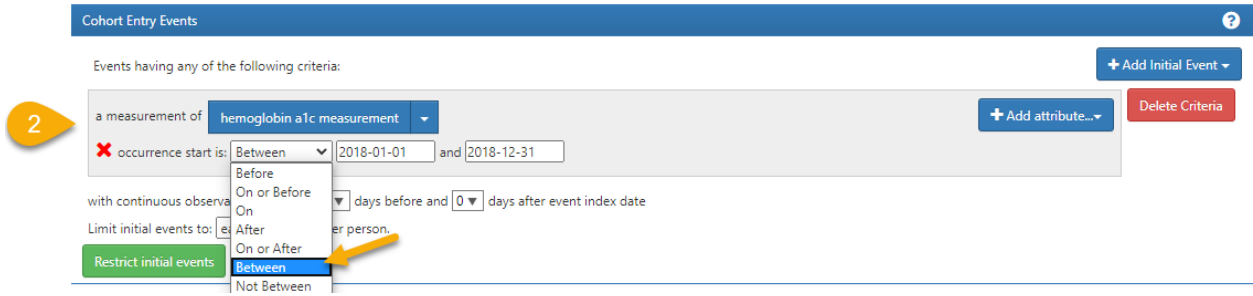
22. Click on the arrow next to the before and you will be given other relative time options.



23. Choose **between** from the drop-down bar.



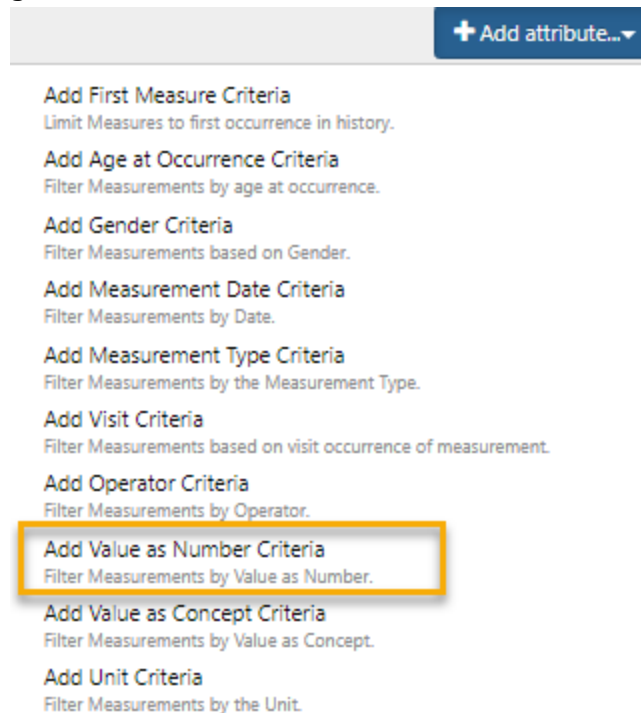
24. Enter the date:time with start date as 2018-01-01 and end date 2018-12-31 in the empty boxes. Note that Atlas includes the dates at each endpoint in its query so you will qualify every test between midnight of January 1, 2018 and captures all lab tests for the entire day of 12/31/18 until midnight of 1/1/19.



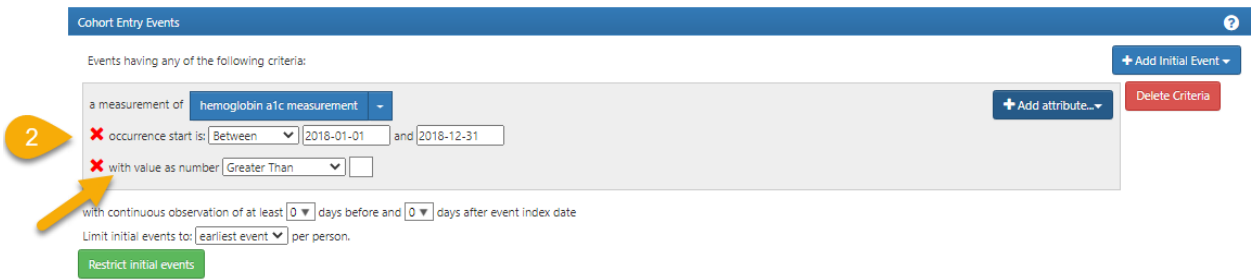
Success choosing the dates!

25. Now that we have the lab test event of hemoglobin a1c, and we have chosen the date attribute that the test occurred between 2018-01-01 and 2018-12-31, we want to add another attribute to require the test to have a **value greater than or equal to 9.5**.

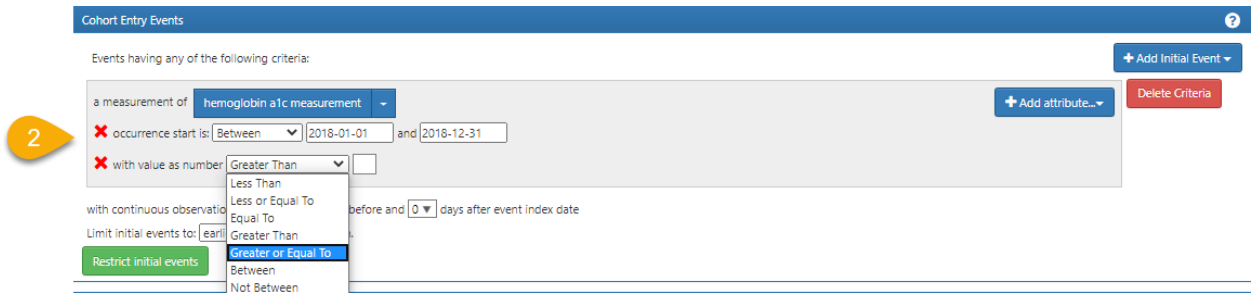
26. Method is the same: Again, click on **add attribute** tab and assign **Add Value as Number Criteria** to the concept of hemoglobin a1c.



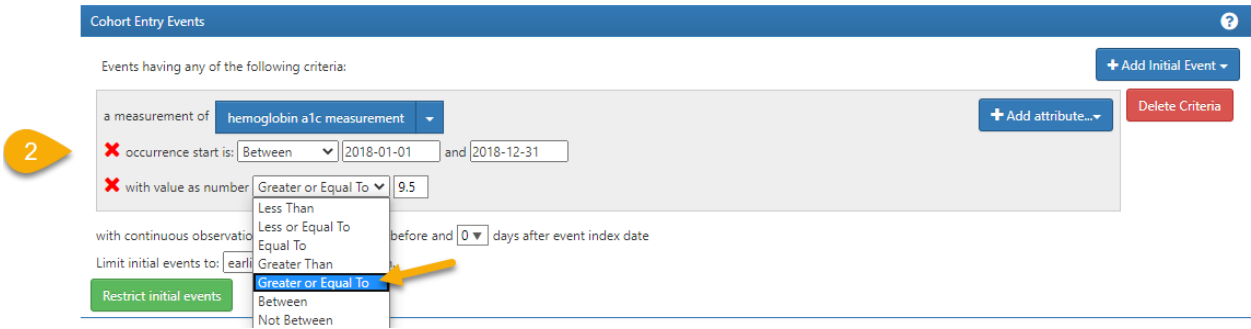
27. Left click on **Add Value as Number Criteria** and notice the new line created within box.



28. The default value as number is “greater than” but we want “greater than or equal to” which we get by clicking on the arrow to the right of the word greater than.

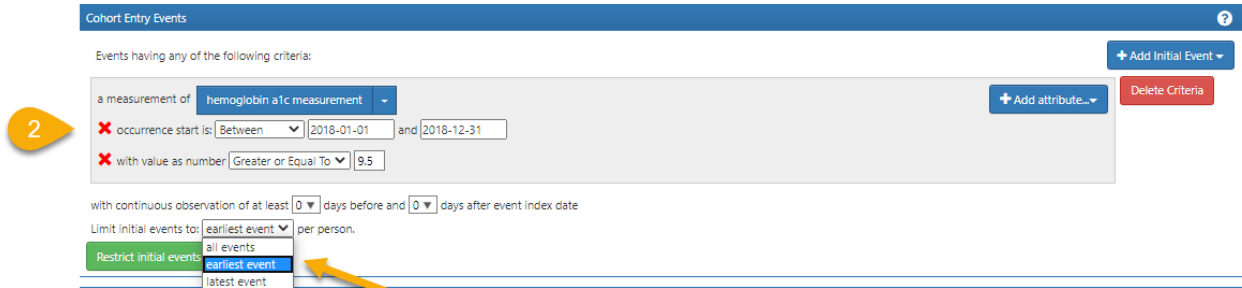


29. From the drop-down bar select the **greater or equal to** and type 9.5 as the value in the assigned box.



30. Now I want to create a single instance for each patient, I want the first time that patient has a hemoglobin a1c greater or equal to 9.5.

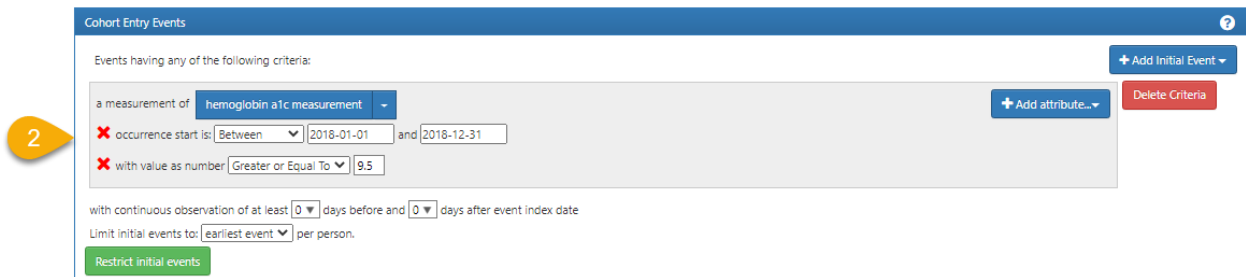
31. Ignore the next line down “with continuous observation”. As long as you leave it alone and do not put a value other than its default zero it will not bother you so do not bother it. We will review this function in subsequent training modules. Go to the line “limit initial events to” and notice the default is exactly what you want “earliest event”.




32. The default line is on earliest event which is the first time that a person has a measurement of hemoglobin a1c in our specified window of time

This now selects for the first hemoglobin a1c in this time interval that meets the value criteria of greater than or equal to 9.5.

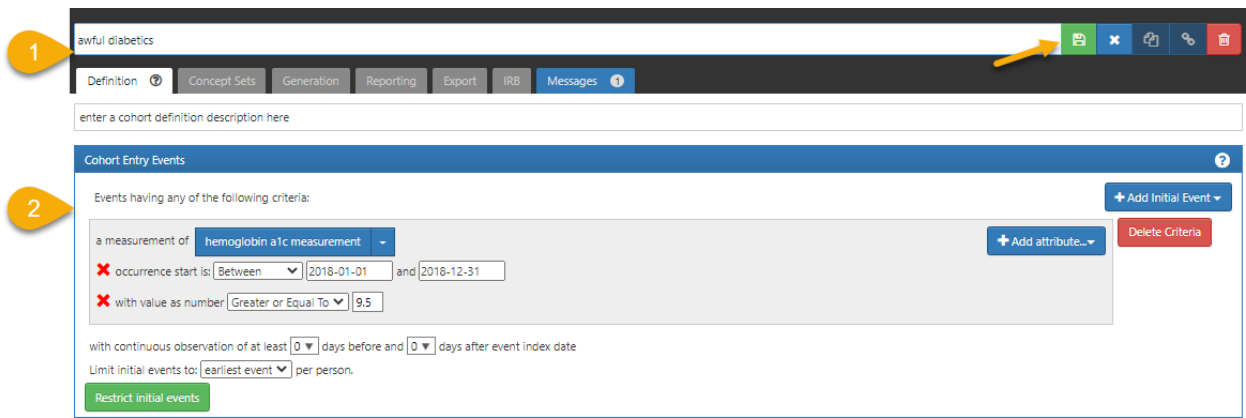
33. Now we are finished with our rules for our first cohort and this is how it looks. Use between image.



34. How do you save this awful diabetic cohort?

35. From **section 1** on top left type your study a name, left click on the green **Save** button . Your cohort is successfully created. If someone else had already named a cohort awful diabetic, the program would reject your name and tell you to rename it. We therefore recommend that you always include your surname as part of whatever name you are creating.

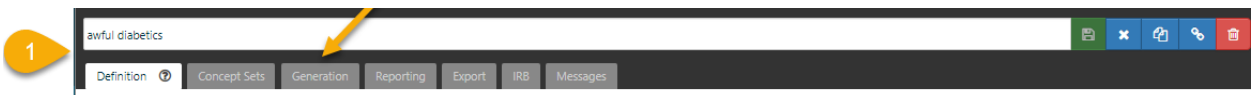
Atlas will not allow the cohort to be saved without first naming it.



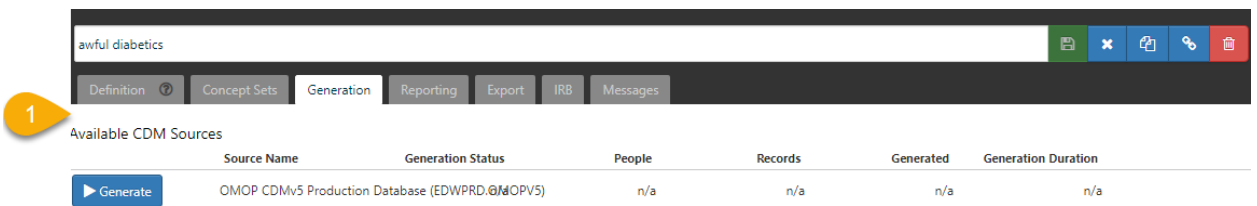
36. We have built and saved the rules for this cohort. Now we want to see how many people qualify for the cohort using these cohort rules.

37. Let's build or generate the cohort to see how many people are in it.

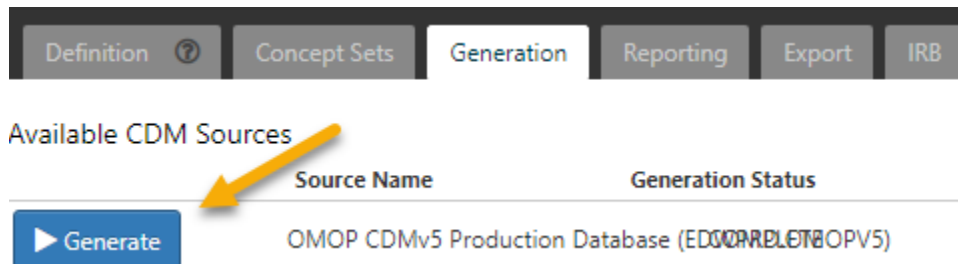
38. In **section 1**, you will notice a greyed out **Generation** tab. Left click on generate to activate the tab.



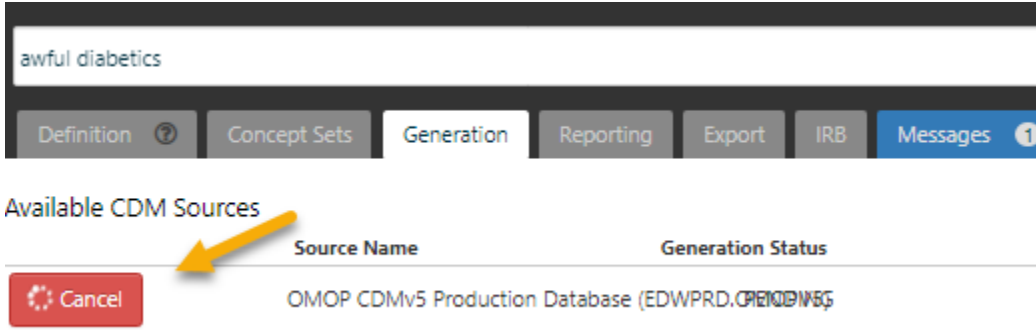
39. Under **Generation** tab a new window opens up.



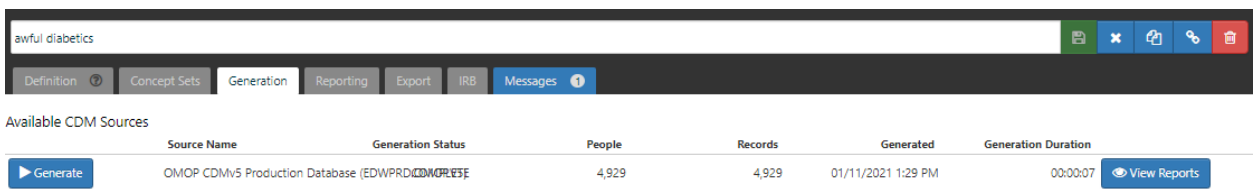
40. Click on **Generate**.




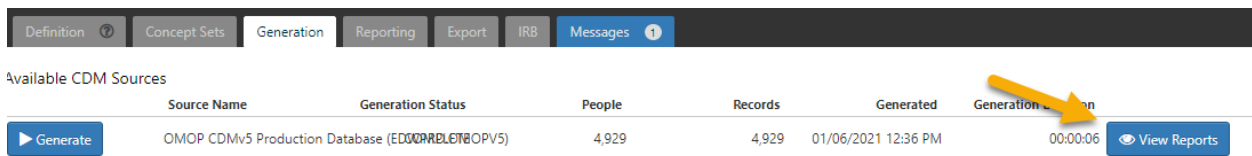
41. While Atlas is working it turns the generate tab red and shows a wheel spinning.



42. The red will turn blue and the word Generate will return when Atlas has finished its work.



43. A blue button will appear on the right with the word “view reports”  Click on the view reports to see the result.



44. This results in the following image with the report appended below.




By Events
By Person

Inclusion Report for OMOP CDMv5 Production Database (EDWPRD.OMOPV5)

	Match Rate	Matches	Total Events
Summary Statistics:	100.00%	4,929	4,929
Inclusion Rule		N	% Satisfied % To-Gain

Population Visualization [Switch to attrition view](#)



45. The result of the table indicates that we have 4,929 patients with hemoglobin a1c greater or equal to 9.5 in our awful diabetic cohort.

We do not save the result of the build (generation). You have to recreate it each time you want to see it. The save only saves the rule, but not what you generated.

Congratulations! You have created your first cohort in Atlas and generated results.

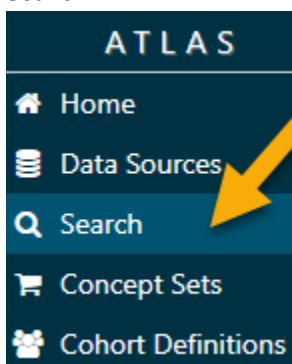
Part II. Diabetics by Diagnosis

We have built a cohort for hemoglobin a1c. Now we are going to build a cohort based upon a Diagnosis of Diabetes.

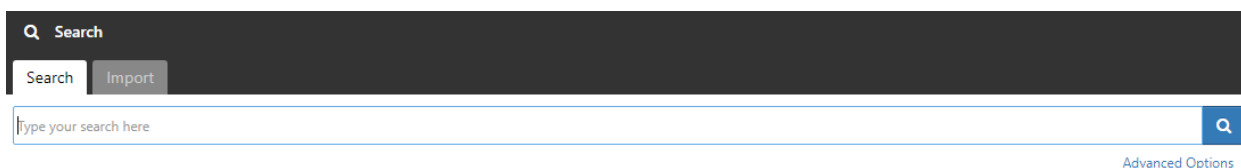
First, we must define a concept of diagnosis of diabetes. Many of these steps will look familiar to you, but we will walk through them together.

Let's find a diabetes cohort using diagnosis of diabetes mellitus.

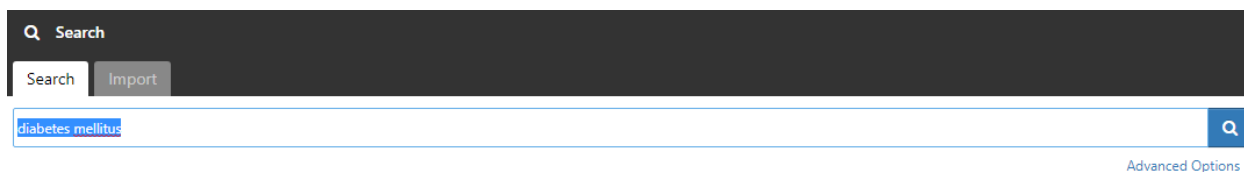
1. From the Atlas navigation tab click on search.

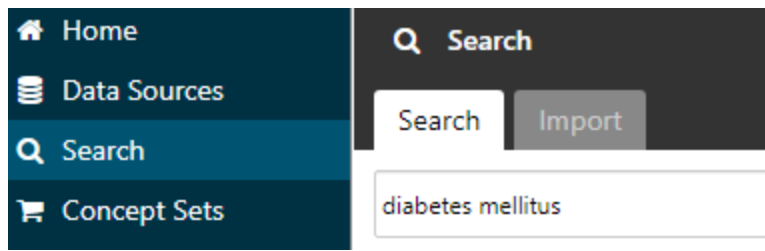


2. A new window opens, giving you a chance to search for diabetes mellitus.

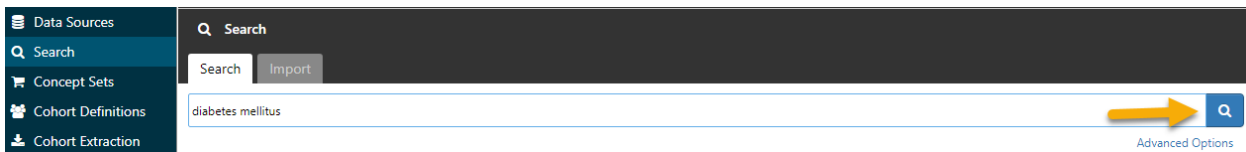


3. In the search bar type diabetes mellitus.





- Left click on the magnifying glass icon on the right.



- A list of concepts related to diabetes mellitus will appear on the screen. We notice the largest number of results as 39,758 is probably the diagnoses that we want to use for diabetes mellitus.

Vocabulary	Id	Code	Name	Class	RC	DRC	Domain	Vocabulary
SNOMED (668)	201820	73211009	Diabetes mellitus	Clinical Finding	39,758	860,008	Condition	SNOMED
ICD10CM (642)	201826	44054006	Type 2 diabetes mellitus	Clinical Finding	369,470	729,020	Condition	SNOMED
Nebraska Lexicon (640)	4008576	111552007	Diabetes mellitus without complication	Clinical Finding	9,036	355,876	Condition	SNOMED
Read (379)	4193704	313436004	Type 2 diabetes mellitus without complication	Clinical Finding	334,902	335,944	Condition	SNOMED
KCD7 (241)	443732	422014003	Disorder due to type 2 diabetes mellitus	Clinical Finding	10	92,403	Condition	SNOMED
Clinical Finding (1185)	201254	46635009	Type 1 diabetes mellitus	Clinical Finding	30,377	50,831	Condition	SNOMED
Read (379)	40482801	443694000	Type II diabetes mellitus uncontrolled	Clinical Finding	44,022	44,022	Condition	SNOMED
7-char billing code (260)	443767	25093002	Disorder of eye due to diabetes mellitus	Clinical Finding	640	43,218	Condition	SNOMED
KCD7 code (241)								
ICD10 code (178)								
Domain								

- Take a closer look at the list, on the first row there is a concept listed “Diabetes Mellitus”. It is probably the diagnoses that we want to use. In fact, when we look at **class and domain**, we notice **class** = Clinical Finding and **domain** = Condition.

Q Search

Search Import

diabetes mellitus

Advanced Options

Column visibility Copy CSV Show 15 entries Filter:

Showing 1 to 15 of 2,970 entries

Vocabulary	Id	Code	Name	Class	RC	DRC	Domain	Vocabulary
SNOMED (668)	201820	73211009	Diabetes mellitus	Clinical Finding	39,758	860,008	Condition	SNOMED
ICD10CM (642)	201826	44054006	Type 2 diabetes mellitus	Clinical Finding	369,470	729,020	Condition	SNOMED
Nebraska Lexicon (640)	4008576	111552007	Diabetes mellitus without complication	Clinical Finding	9,036	355,876	Condition	SNOMED
Read (379)	4193704	313436004	Type 2 diabetes mellitus without complication	Clinical Finding	334,902	335,944	Condition	SNOMED
VCD7 (241)	443732	422014003	Disorder due to type 2 diabetes mellitus	Clinical Finding	10	92,403	Condition	SNOMED
Class	201254	46635009	Type 1 diabetes mellitus	Clinical Finding	30,377	50,831	Condition	SNOMED
Clinical Finding (1185)	40482801	443694000	Type II diabetes mellitus uncontrolled	Clinical Finding	44,022	44,022	Condition	SNOMED
Read (379)	443767	25093002	Disorder of eye due to diabetes mellitus	Clinical Finding	640	43,218	Condition	SNOMED
7-char billing code (260)								
KCD7 code (241)								
ICD10 code (178)								
Domain								

7. Choose this item

Q Search

Search Import

diabetes mellitus

Advanced Options

Column visibility Copy CSV Show 15 entries Filter:

Showing 1 to 15 of 2,970 entries

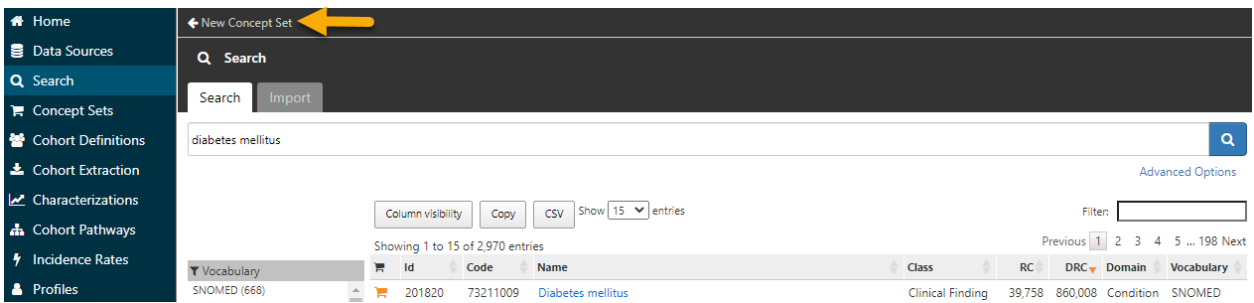
Vocabulary	Id	Code	Name	Class	RC	DRC	Domain	Vocabulary
SNOMED (668)	201820	73211009	Diabetes mellitus	Clinical Finding	39,758	860,008	Condition	SNOMED
ICD10CM (642)	201826	44054006	Type 2 diabetes mellitus	Clinical Finding	369,470	729,020	Condition	SNOMED
Nebraska Lexicon (640)	4008576	111552007	Diabetes mellitus without complication	Clinical Finding	9,036	355,876	Condition	SNOMED
Read (379)	4193704	313436004	Type 2 diabetes mellitus without complication	Clinical Finding	334,902	335,944	Condition	SNOMED
VCD7 (241)	443732	422014003	Disorder due to type 2 diabetes mellitus	Clinical Finding	10	92,403	Condition	SNOMED
Class	201254	46635009	Type 1 diabetes mellitus	Clinical Finding	30,377	50,831	Condition	SNOMED
Clinical Finding (1185)	40482801	443694000	Type II diabetes mellitus uncontrolled	Clinical Finding	44,022	44,022	Condition	SNOMED
Read (379)	443767	25093002	Disorder of eye due to diabetes mellitus	Clinical Finding	640	43,218	Condition	SNOMED
7-char billing code (260)								
KCD7 code (241)								
ICD10 code (178)								
Domain								

8. Click on the shopping cart beside the concept you want to choose. Notice the icon on its left.

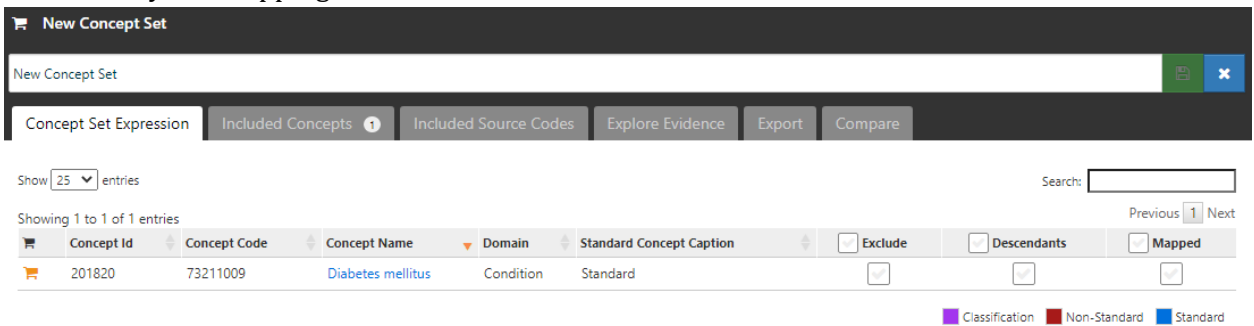
Showing 1 to 15 of 2,970 entries

Id	Code	Name	Class	RC	DRC	Domain	Vocabulary
201820	73211009	Diabetes mellitus	Clinical Finding	39,758	860,008	Condition	SNOMED

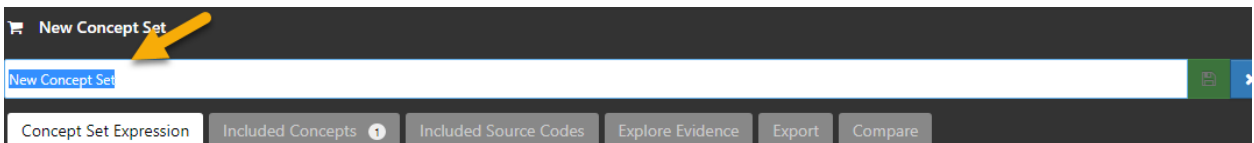
9. While clicking on the shopping card symbol, on the top left, the phrase 'New concept set' appears.



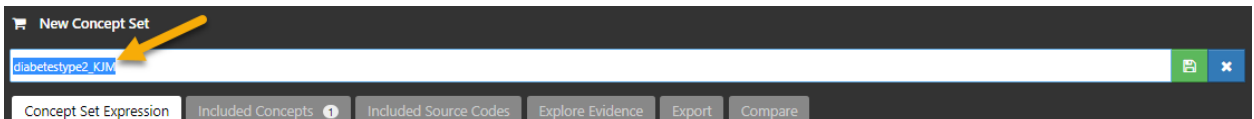
10. Click on the phrase new concept set. This will clean up your screen leaving you only with the contents of your shopping cart.




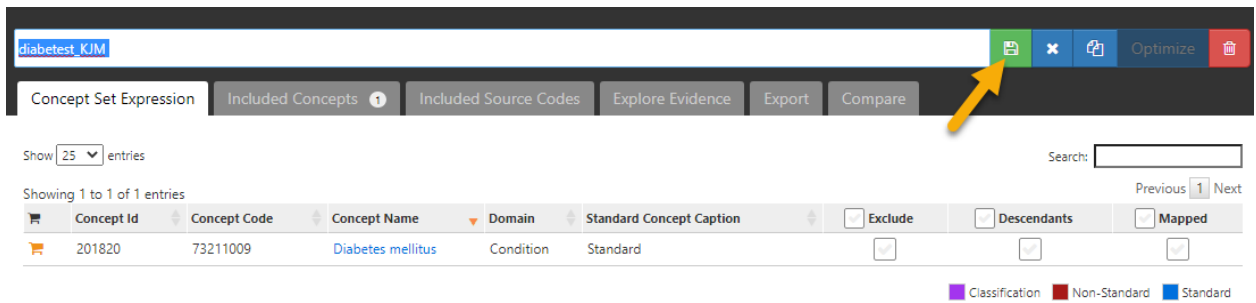
11. Now name the concept set you have chosen.



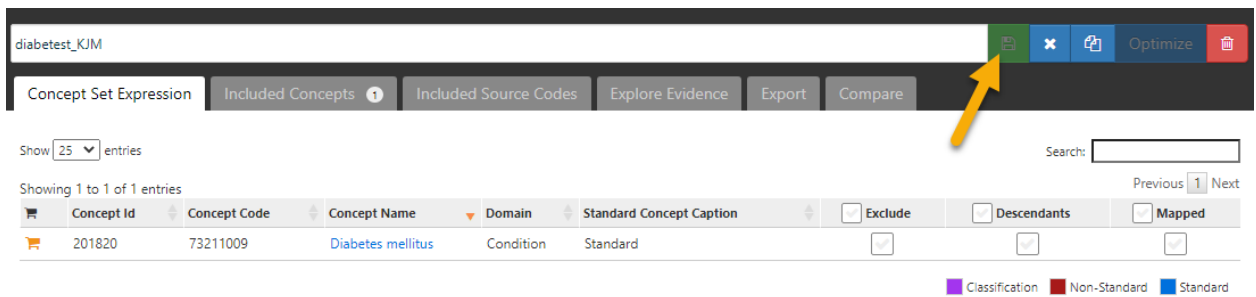
12. I have renamed it to diabetest_KJM.



13. Now **Save** by clicking on the green  tab.



14. When the save button changes color, you are ready to use this concept of diabetes mellitus to build a cohort.

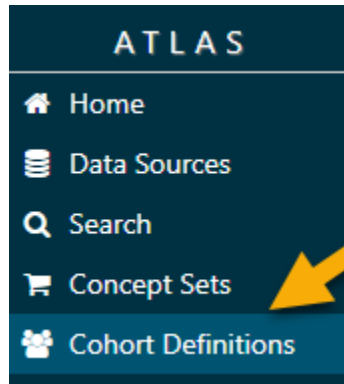


15. Click on x button to complete the concept creation.

Now Let's build a cohort for diabetes mellitus using the Diabetes Mellitus concept you just built.

Building a Cohort:

1. From Atlas navigation tab click on the **cohort definition**.

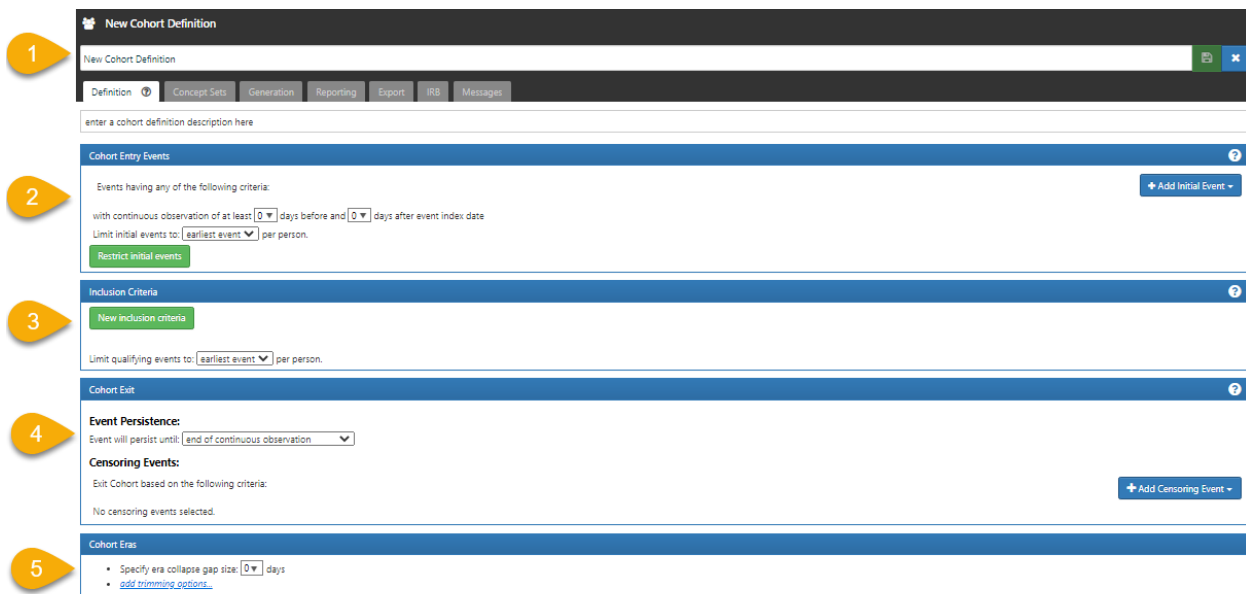


2. A new window opens up click on the blue button on the right new cohort.



3. A new window opens.

Again, we orient ourselves to the cohort definition window.



4. Look at section 2, the **cohort entry event**.

Cohort Entry Events

Events having any of the following criteria:

with continuous observation of at least 0 days before and 0 days after event index date

Limit initial events to: earliest event per person.

+ Add Initial Event

Restrict initial events

5. Click on “add initial event”

Cohort Entry Events

Events having any of the following criteria:

with continuous observation of at least 0 days before and 0 days after event index date

Limit initial events to: earliest event per person.

+ Add Initial Event

Restrict initial events

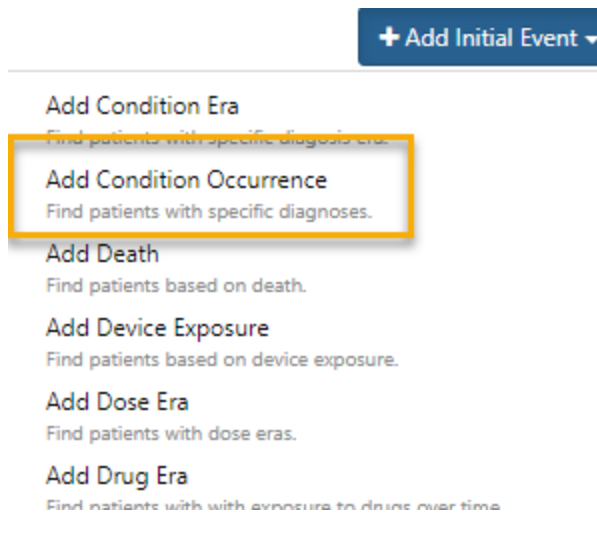
A new window opens allowing you to choose concept sets to qualify your cohort members.

6. Which of these events do you think you need to use to get a diagnoses of diabetes mellitus?

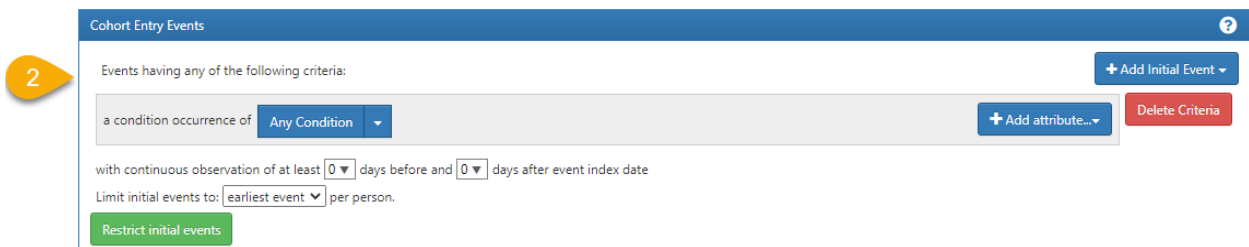
+ Add Initial Event ▾

- Add Condition Era**
Find patients with specific diagnosis era.
- Add Condition Occurrence**
Find patients with specific diagnoses.
- Add Death**
Find patients based on death.
- Add Device Exposure**
Find patients based on device exposure.
- Add Dose Era**
Find patients with dose eras.
- Add Drug Era**
Find patients with exposure to drugs over time.
- Add Drug Exposure**
Find patients with exposure to specific drugs or drug classes.
- Add Measurement**
Find patients based on Measurement.
- Add Observation**
Find patients based on lab tests or other observations.
- Add Observation Period**
Find patients based on Observation Period.
- Add Payer Plan Period**
Find patients based on Payer Plan Period.
- Add Procedure Occurrence**
Find patients that experienced a specific procedure.
- Add Specimen**
Find patients based on Specimen.
- Add Visit**
Find patients based on visit information.

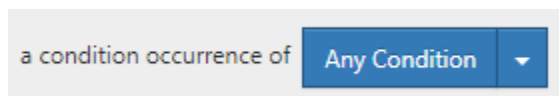
7. Answer: select **Add Condition Occurrence**. This will lead us to the saved concept for diagnoses of diabetes mellitus.



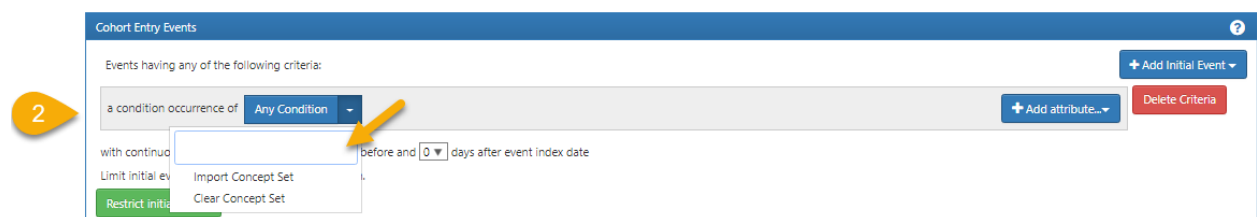
8. A window opens that says any Condition.



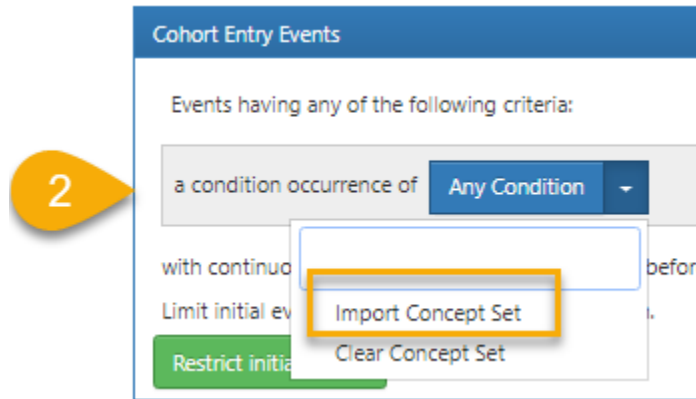
9. Pay attention to **Any Condition** drop down.



10. Click on the icon  a new tab opens allowing you to access your prebuild concepts.



11. Click on **Import concept set**.



12. A list of available concepts will appear (below). Choose your created concept set. The name I've given my concept set is "diabetest_KJM" so this is what I will choose.

Import Concept Set From Repository...

New Concept Set

Show 10 entries

Filter Repository Concept Sets:

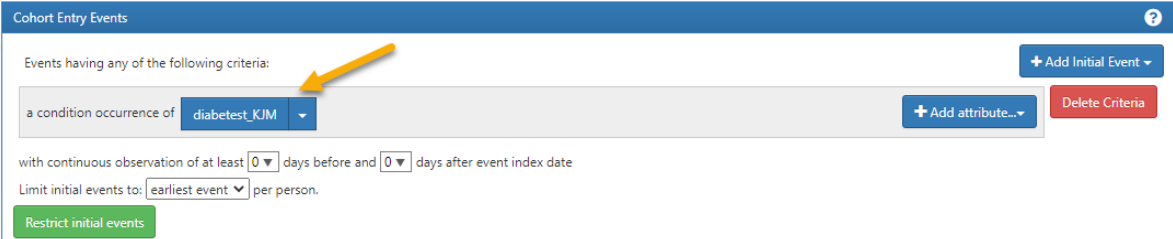
	Created	Modified	Author
333 diabetest_KJM	01/12/2021 11:54 PM	01/12/2021 11:54 PM	kjabbarymo
332 diabetestype2_KJM	01/12/2021 12:56 PM	01/12/2021 12:56 PM	kjabbarymo
331 Ertapenem New	01/12/2021 11:12 AM	01/12/2021 11:12 AM	andriano
330 Ertapenem	01/12/2021 10:59 AM	01/12/2021 10:59 AM	andriano
255 hemoglobin a1c measurement	11/04/2020 1:57 PM	01/08/2021 12:23 PM	kjabbarymo
326 Grand Multiparity	12/28/2020 5:56 PM	12/28/2020 6:02 PM	dsagaram
325 Endotracheal Intubation	12/26/2020 10:38 PM	12/26/2020 10:38 PM	jrosiene
323 SARS ag	12/23/2020 10:42 AM	12/23/2020 10:42 AM	agalan
322 sars_coronavirus_v0.1	12/23/2020 9:55 AM	12/23/2020 9:55 AM	kjabbarymo
318 DEMO_HF_4	12/09/2020 4:29 PM	12/09/2020 4:31 PM	ssoby

Showing 1 to 10 of 247 entries

Previous 1 2 3 4 5 ... 25 Next

13. Click on the your diabetes concept.

This will assign the concept of **Diabetes mellitus** to the **Any Condition** box and you will see this as in the image below.

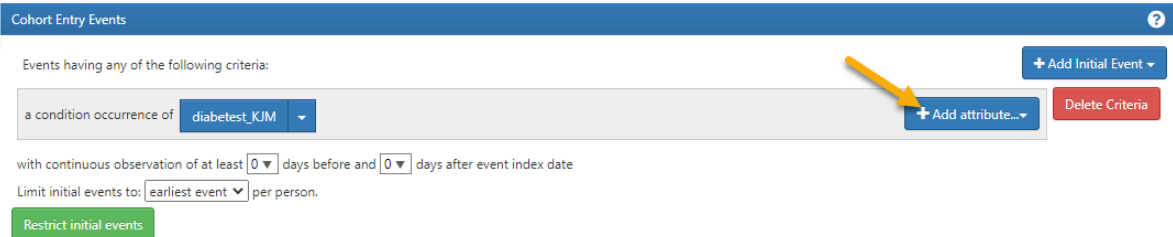


The screenshot shows the 'Cohort Entry Events' interface. A yellow callout bubble with the number '2' is positioned to the left of the main content area. The main content area has a blue header with the text 'Cohort Entry Events' and a question mark icon. Below the header, the text 'Events having any of the following criteria:' is followed by a '+ Add Initial Event' button. The main criteria box contains the text 'a condition occurrence of' followed by a dropdown menu showing 'diabetest_KJM'. To the right of this dropdown is a '+ Add attribute...' button and a 'Delete Criteria' button. Below the criteria box, there are two input fields for 'with continuous observation of at least' and 'days after event index date', both set to '0'. Below these is a 'Limit initial events to:' dropdown set to 'earliest event' and 'per person.' At the bottom left of the main content area is a green 'Restrict initial events' button.

14. So far, we have successfully chosen the diagnoses for diabetes mellitus.

15. Now we have to specify the time that diagnoses have occurred.

16. Time when the diagnoses occurred is an attribute of the condition and all attributes are selected by clicking on the **Add attribute** tab.



This screenshot is identical to the one above, but with a yellow arrow pointing to the '+ Add attribute...' button in the criteria box.

17. A window opens, allowing you to choose the attribute of interest.

+ Add attribute...▼

Add First Diagnosis
Limit Condition Occurrences to new diagnosis.

Add Age at Occurrence
Filter Condition Occurrences by age at occurrence.

Add Gender
Filter Condition Occurrences based on Gender.

Add Condition Start Date
Filter Condition Occurrences by the Condition Start Date.

Add Condition End Date
Filter Condition Occurrences by the Condition End Date

Add Condition Type
Filter Condition Occurrences by the Condition Type.

Add Visit
Filter Condition Occurrences based on visit occurrence of diagnosis.

Add Stop Reason
Filter Condition Occurrences by the Stop Reason.

Add Condition Source Concept
Filter Condition Occurrences by the Condition Source Concept.

Add Provider Specialty
Filter Condition Occurrences based on provider specialty.

Add Nested Criteria...
Apply criteria using the condition occurrence as the index date

18. Which of these attributes of interest will allow you to set the date of the diagnosis?

19. Answer: **Add Condition Start Date.**

+ Add attribute...▼

Add First Diagnosis
Limit Condition Occurrences to new diagnosis.

Add Age at Occurrence
Filter Condition Occurrences by age at occurrence.

Add Gender
Filter Condition Occurrences based on Gender.

Add Condition Start Date
Filter Condition Occurrences by the Condition Start Date.

Add Condition End Date
Filter Condition Occurrences by the Condition End Date

Add Condition Type
Filter Condition Occurrences by the Condition Type.

Add Visit
Filter Condition Occurrences based on visit occurrence of diagnosis.

20. Left click on the words “add condition start date“. A new window opens allowing you to set the interval of time during which diagnoses occurred.

Cohort Entry Events

Events having any of the following criteria:

a condition occurrence of **diabetest_KIM**

occurrence start is: **Before** YYYY-MM-DD

with continuous observation of at least 0 days before and 0 days after event index date

Limit initial events to: **earliest event** per person.

Restrict initial events

+ Add Initial Event

+ Add attribute...

Delete Criteria

21. We do not want to select a time before a date but rather an interval of dates between which the diagnosis was observed.

22. Click on the arrow next to the before and you will be given other relative time options.

Cohort Entry Events

Events having any of the following criteria:

a condition occurrence of **diabetest_KIM**

occurrence start is: **Before** YYYY-MM-DD

with continuous observation of at least 0 days before and 0 days after event index date

Limit initial events to: **earliest event** per person.

Restrict initial events

+ Add Initial Event

+ Add attribute...

Delete Criteria

Between

23. Choose **between** from the drop-down bar.

Cohort Entry Events

Events having any of the following criteria:

a condition occurrence of **diabetest_KIM**

occurrence start is: **Between** YYYY-MM-DD and YYYY-MM-DD

with continuous observation of at least 0 days before and 0 days after event index date

Limit initial events to: **earliest event** per person.

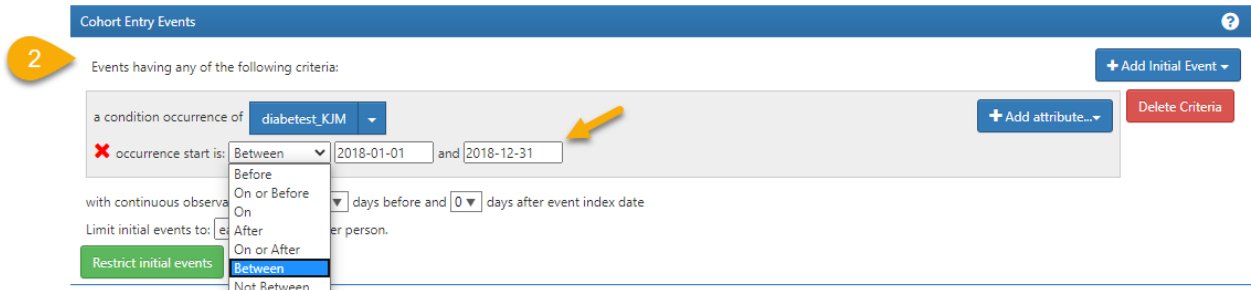
Restrict initial events

+ Add Initial Event

+ Add attribute...

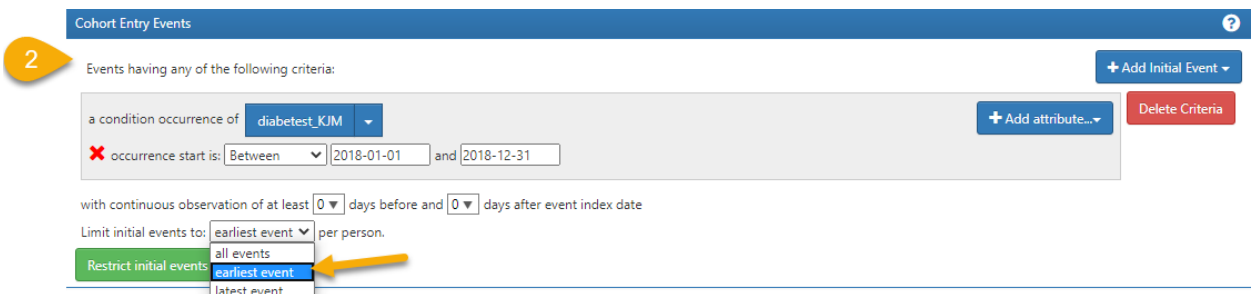
Delete Criteria

24. Enter the date: time with start date as 2018-01-01 and end date 2018-12-31 in the empty boxes. Atlas includes the dates at each endpoint in its query so you will qualify every test between midnight of January 1, 2018 and captures all lab tests for the entire day of 12/31/18 until midnight of 1/1/19.



25. Next we have to make sure that we are capturing the earliest event.

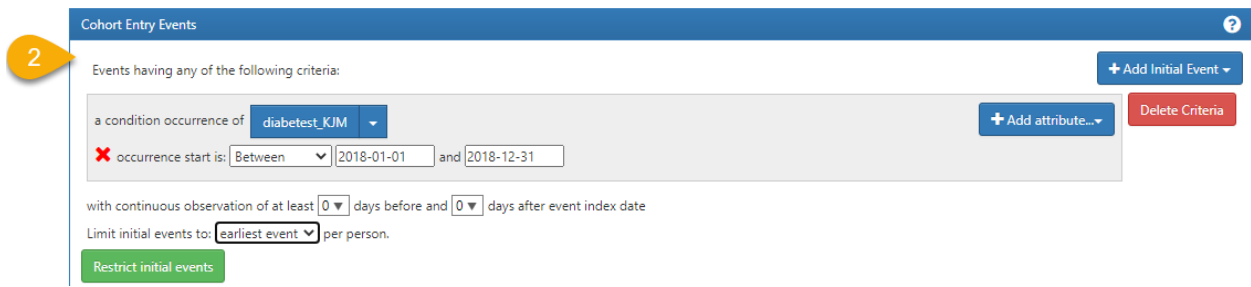
26. Ignore the next line down “with continuous observation”. As stated earlier, as long as you leave it alone and do not put a value other than its default zero it will not bother you so do not bother it. Go to the line “limit initial event to” and notice the default is exactly what you want earliest event.



27. The default line is on earliest event which is the first time that a person has a diagnoses of diabetes mellitus.

This now selects for the first diagnoses in this time interval we are interested in.

28. Now we are finished with our rules for our diagnostic cohort and this is how it looks.

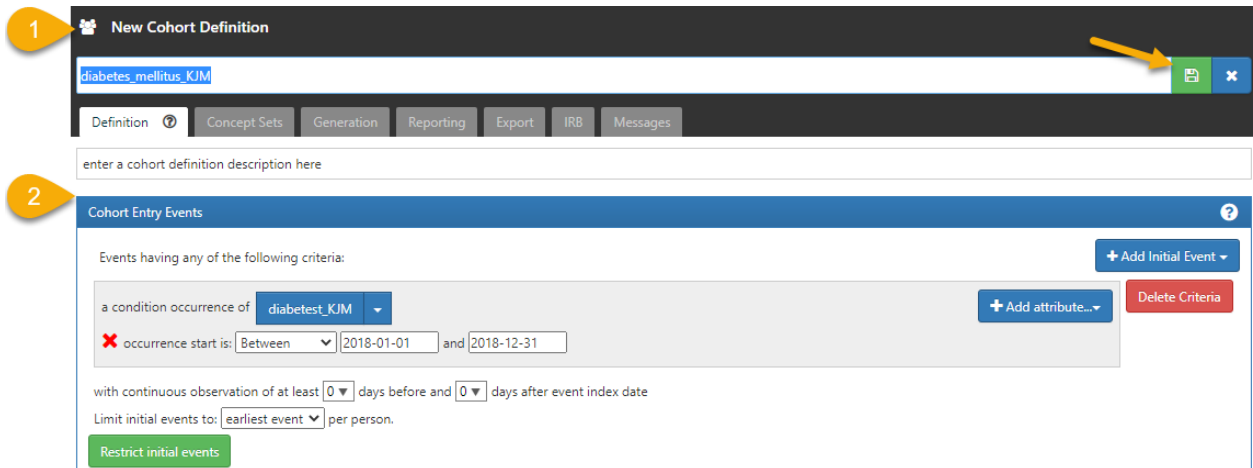


29. How do you save this diabetes mellitus cohort? Let's learn how!

30. From **section 1** on the top left, give your cohort a name, then left click on the green **Save** button



. Your cohort is successfully created.



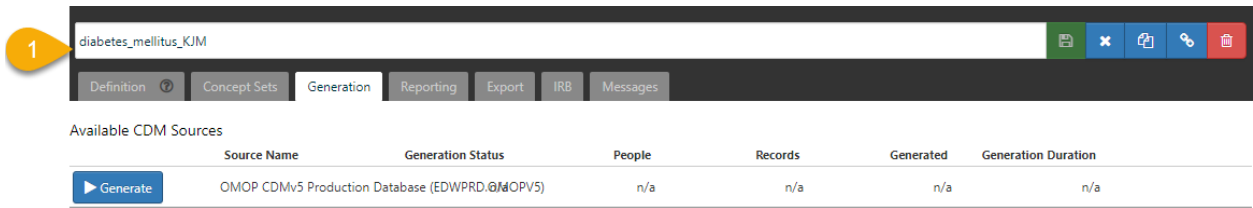
The save is signaled to you when the light green button changes to dark green.

31. We have built and saved the rules for this cohort. Now we want to see how many people qualify for the cohort using these cohort rules.

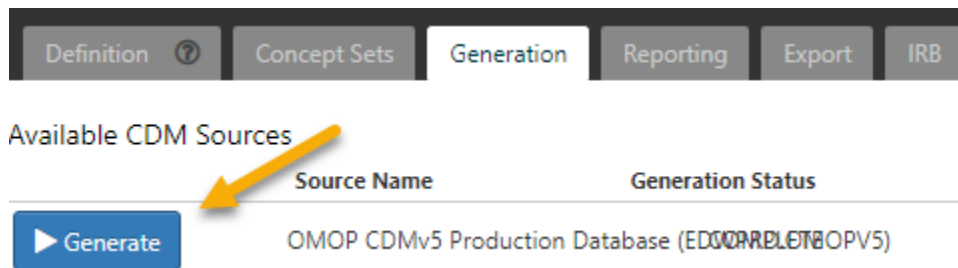
32. Let's build or generate the cohort and see how many people are in it.

33. In **section 1**, you will notice a greyed out **Generation** tab. Left click on generate to activate the tab.

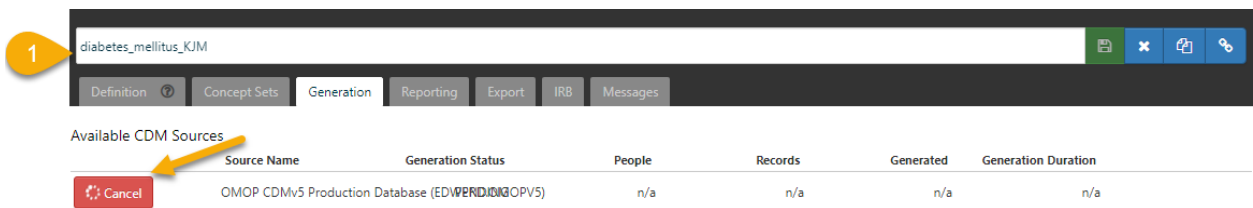
34. Under the **Generation** tab a new window opens up.



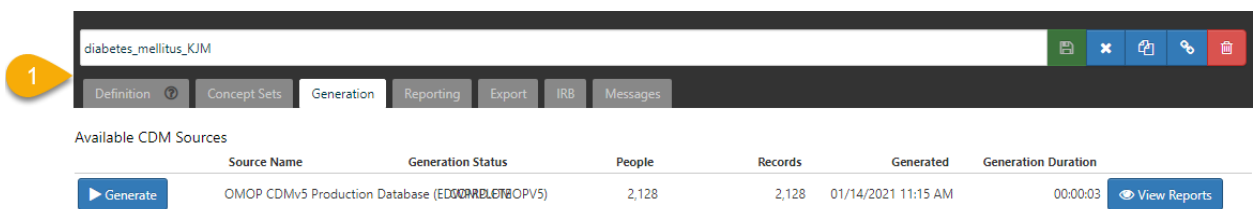
35. Click on **Generate**.



36. While Atlas is working it turns the generate tab red and shows a wheel spinning.



37. The red will turn blue and the word **Generate** will return when Atlas has finished its work.



38. Click on the blue button will appear on the right with the word “view reports”



click on the view reports to see the result.

Source Name	Generation Status	People	Records	Generated	Generation Duration
OMOP CDMv5 Production Database (EDWPRD.OMOPV5)	COMPLETE	2,128	2,128	01/14/2021 11:15 AM	00:00:03

39. This results in the following image with the report appended below.

Source Name	Generation Status	People	Records	Generated	Generation Duration
OMOP CDMv5 Production Database (EDWPRD.OMOPV5)	COMPLETE	2,128	2,128	01/14/2021 11:15 AM	00:00:03

Inclusion Report for OMOP CDMv5 Production Database (EDWPRD.OMOPV5)			
	Match Rate	Matches	Total Events
Summary Statistics:	100.00%	2,128	2,128
Inclusion Rule		N	% Satisfied
			% To-Gain

40. The result of the table indicates that we have 2,128 patients with diagnoses of diabetes mellitus in our new diabetic cohort.

As instructed in the previous exercise, we do not save the result of the build (generation). You have to recreate it each time you want to see it. The save only saves the rule.

Let's evaluate what our results tell us:

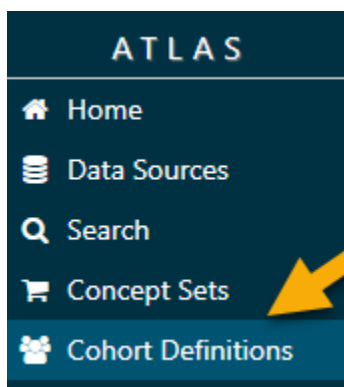
Are you surprised by the numbers? We have only 2,128 people identified with Diabetes Mellitus. Yet we know 4,292 people had a hgba1c greater than or equal to 9.5. This is improbable if not impossible.

To look further into this, repeat the analysis of hgba1c and use 6.5 as the value. Show the increase in total N compared with the awful diabetic criteria of greater than or equal to (GE) 9.5.

We now want to use a laboratory criterion for diabetes that is more inclusive. We will look for a HgbA1c criterion of greater than or equal to 6.5 which is the American Diabetes Association lab criterion for diabetes. We will show you some tricks to build this quickly on the skeleton you have already built for awful diabetics.

Let's modify the awful diabetic cohort:

1. From Atlas navigation tab click on the **cohort definition**.



2. A new window opens showing a list of pre-existing cohorts. These cohort are the ones you have made privately in they are not public.

Cohort Definitions

Column visibility Copy CSV Show 15 entries

Showing 1 to 15 of 124 entries

	Id	Name	Created	Updated
Last Modified				
2+ Weeks Ago (117)	337	diabetes hemoglobin a1c>6.5	01/14/2021 10:24 PM	01/15/2021 1:57 PM
This Week (4)	294	prolonged diabetes cohort	11/30/2020 2:26 PM	01/14/2021 2:58 PM
Last Week (3)				
Author	329	awful diabetics	01/11/2021 9:31 AM	01/14/2021 2:25 PM
kjabbarymo (123)	336	diabetes mellitus_KJM	01/14/2021 11:13 AM	01/14/2021 2:24 PM
mginsber (1)	330	covid intubated_example	01/11/2021 4:20 PM	01/11/2021 4:20 PM
	326	sample_cohort	01/07/2021 3:36 PM	01/07/2021 4:01 PM
	317	original_cohort	12/21/2020 10:48 AM	01/07/2021 1:41 PM
	324	prolonged diabetes cohort (nested)	01/04/2021 12:22 PM	01/04/2021 12:58 PM
	295	diabetes controlled cohort	11/30/2020 2:47 PM	12/21/2020 1:45 PM
	312	diabetes controlled cohort demographic datetime filtered	12/09/2020 10:30 AM	12/16/2020 10:50 AM
	314	COPY OF: diabetes controlled cohort	12/11/2020 10:18 AM	12/11/2020 2:51 PM
	281	tandriano test	11/24/2020 12:16 PM	11/24/2020 4:49 PM
	279	heart failure outcome test v 0.1	11/23/2020 11:31 AM	11/23/2020 11:32 AM
	278	covid negative patients with heart failure test v 0.1	11/23/2020 11:27 AM	11/23/2020 11:28 AM
	277	covid positive patients with heart failure test v 0.1	11/23/2020 11:18 AM	11/23/2020 11:25 AM

Showing 1 to 15 of 124 entries

3. Notice the awful diabetes cohort that we have already constructed is on the list. Left click on it.

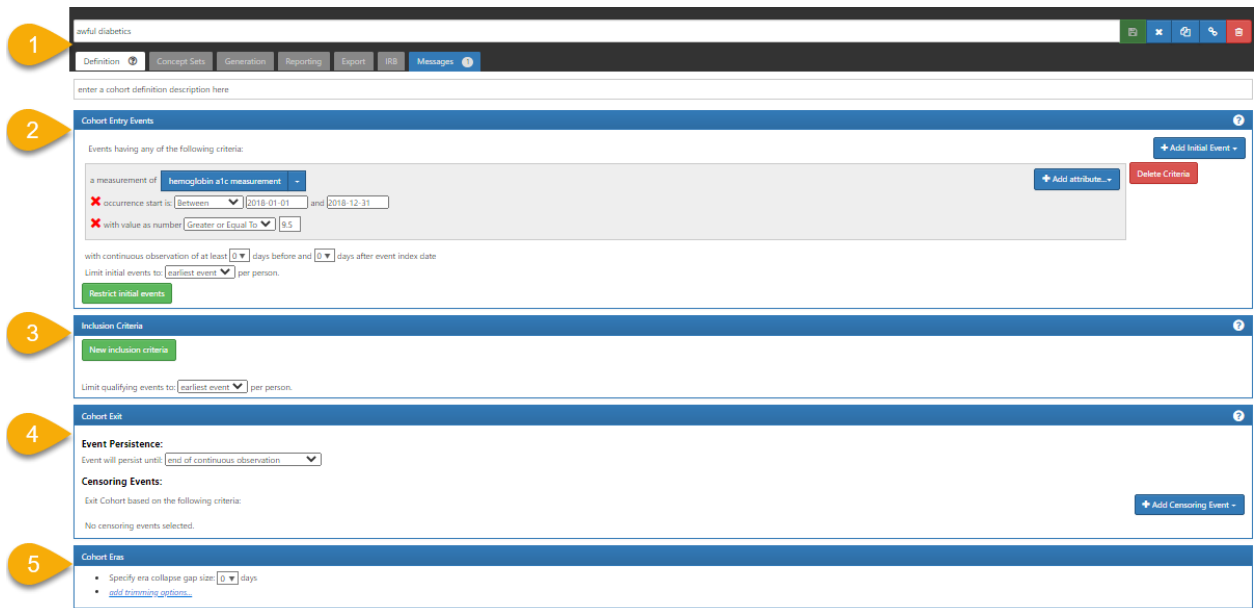
Cohort Definitions

Column visibility Copy CSV Show 15 entries

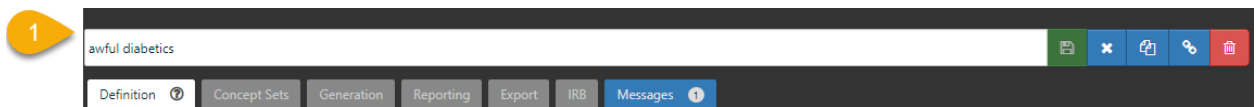
Showing 1 to 15 of 124 entries

	Id	Name	Created	Updated
Last Modified				
2+ Weeks Ago (117)	337	diabetes hemoglobin a1c>6.5	01/14/2021 10:24 PM	01/15/2021 1:57 PM
This Week (4)	294	prolonged diabetes cohort	11/30/2020 2:26 PM	01/14/2021 2:58 PM
Last Week (3)				
Author	329	awful diabetics	01/11/2021 9:31 AM	01/14/2021 2:25 PM
kjabbarymo (123)	336	diabetes mellitus_KJM	01/14/2021 11:13 AM	01/14/2021 2:24 PM
mginsber (1)	330	covid intubated_example	01/11/2021 4:20 PM	01/11/2021 4:20 PM

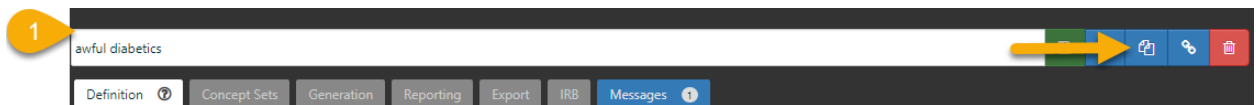
4. The cohort window will open as below.



5. Let's focus on **section 1**.



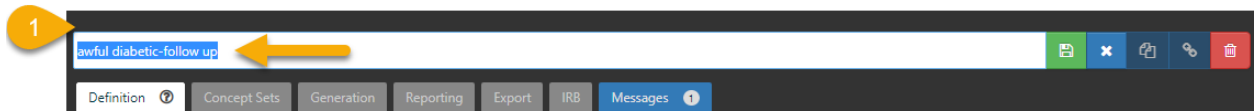
6. There is a copy  button on the top right click on it. This will create a copy of your cohort automatically.



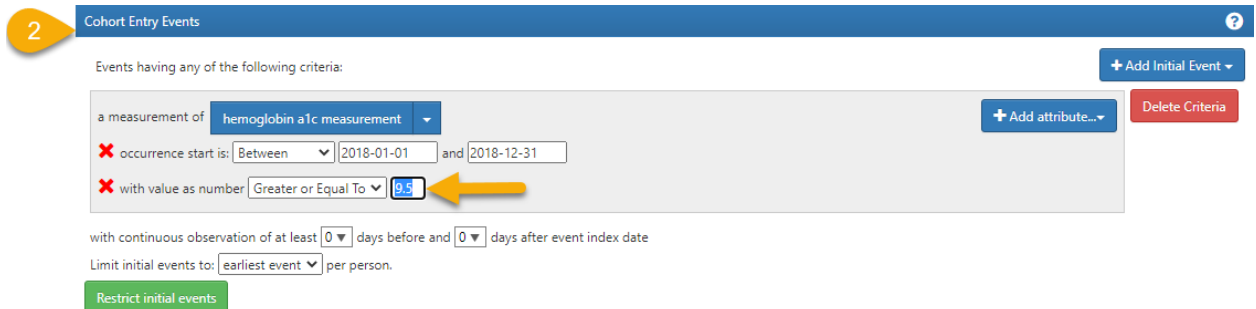
7. Automatically you will see a new copy of awful diabetics will open. We are going to use this copy from now on.



8. First, rename your cohort to **awful diabetic-follow up**.

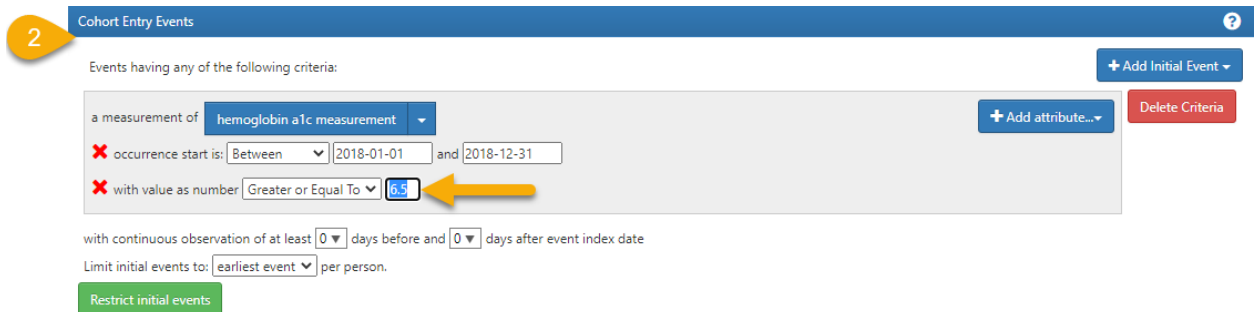


9. Pay attention to section 2, we want to modify the **value as number** from 9.5 to 6.5.

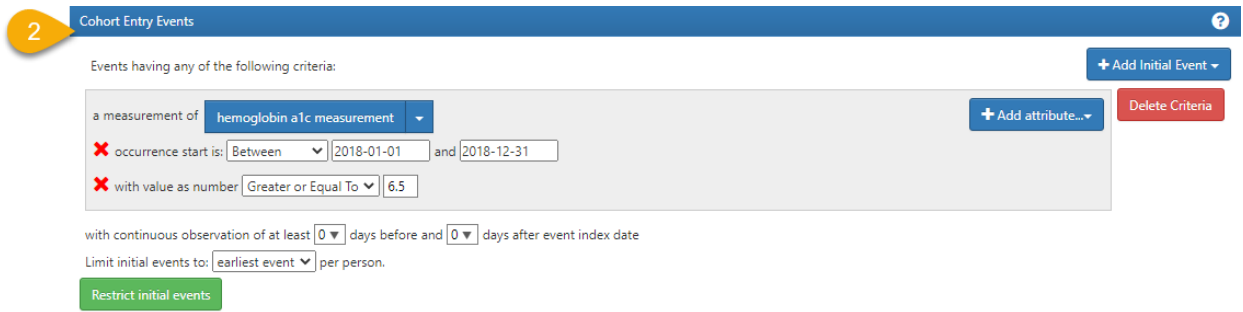


10. Notice the line '**the value as number**' with a value '**greater or equal to 9.5**', our goal is to modify the number to **6.5**.


11. In the box in front of the **greater or equal to** change the value from 9.5 to the new value **6.5**.



12. When done, this is the final look after modification in **section 2**

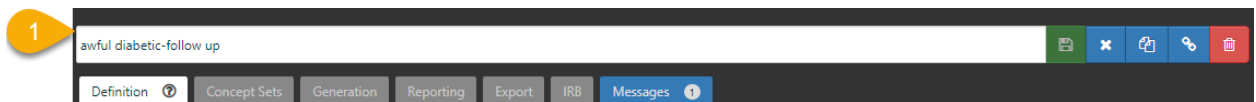


13. Next, we want to make sure we save this cohort.

14. From top right in section one, click on the  .

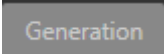


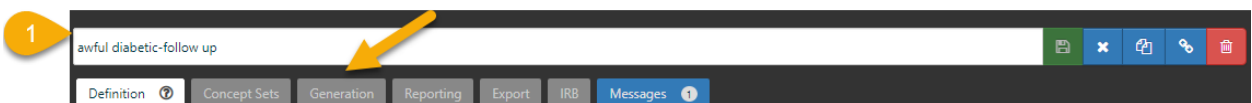
15. Notice when cohort is saved the bright save button will go dim.



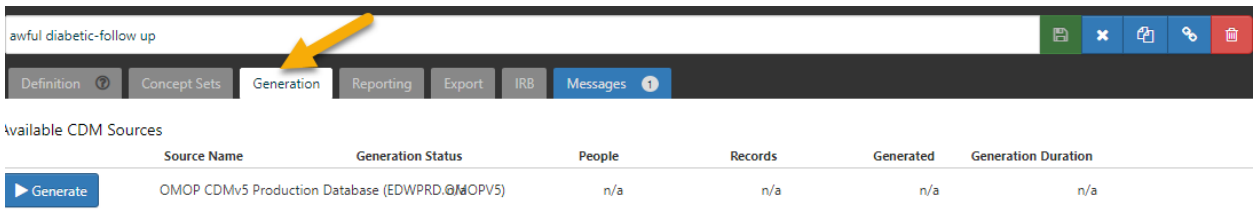
16. We have saved the new rules for this cohort. Now we want to see how many people qualify for the cohort using these cohort rules.

17. Let's build or generate the cohort and see how many people are in it.

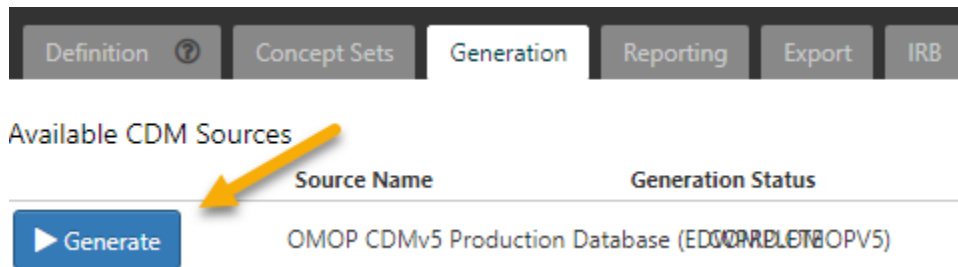
18. In **section 1**, you will notice a greyed out  left click on generate to activate the tab.



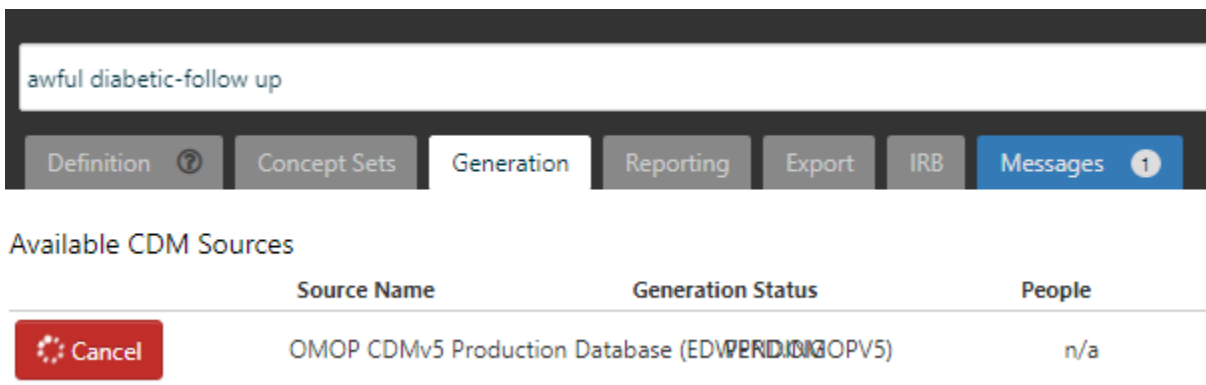
19. Under **Generation** tab a new window opens.



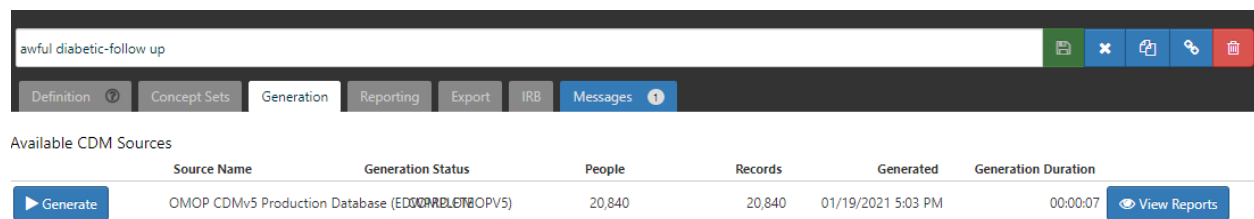
20. Once more click on **Generate**.




21. While Atlas is working it turns the generate tab red and shows a wheel spinning.

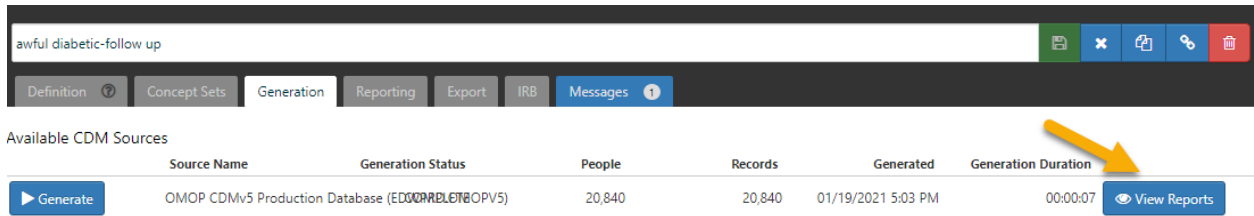


22. The red will turn blue and the word Generate will return when Atlas has finished its work.

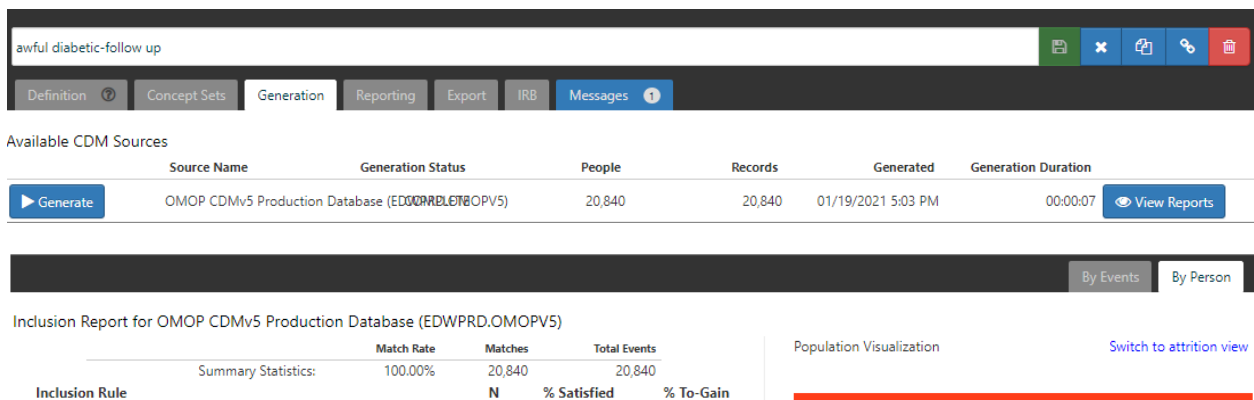


23. Click on the blue button will appear on the right with the word "view reports"

24.  Click on the view reports to see the result.



25. This results in the following image with the report appended below.

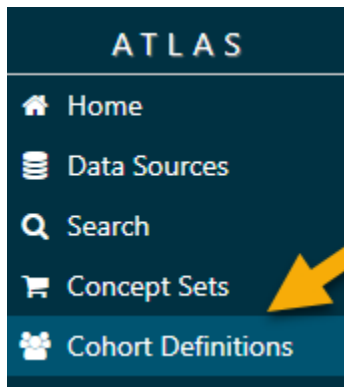


26. The result of the table indicates that we have 20,840 patients with hemoglobin a1c **greater than or equal** 6.5 while in our awful diabetic we had only 4929 which makes sense as our new definition is much more inclusive.

Part III. Who among our diabetics were seen in follow up?

We next want to discover how many people had appropriate follow up - a repeat hgba1c in 180 – 365 days after the date of their awful diabetes test. We will take advantage of a facility in Atlas that allows us to reuse (copy) old rules and make a modification so we do not have to build a cohort from scratch.

1. From the Atlas navigation tab click on cohort definition.



2. A list will open showing you the cohorts you have created.

Cohort Definitions

Column visibility Copy CSV Show 15 entries Filter

Showing 1 to 15 of 124 entries Previous

Last Modified	Id	Name	Created	Updated
2+ Weeks Ago (117)	337	diabetes hemoglobin a1c>6.5	01/14/2021 10:24 PM	01/15/2021 1:57 PM
This Week (4)	294	prolonged diabetes cohort	11/30/2020 2:26 PM	01/14/2021 2:58 PM
Last Week (3)	329	awful diabetics	01/11/2021 9:31 AM	01/14/2021 2:25 PM
Author	336	diabetes mellitus KJM	01/14/2021 11:13 AM	01/14/2021 2:24 PM
kjabbarymo (123)	330	covid intubated example	01/11/2021 4:20 PM	01/11/2021 4:20 PM
mginsber (1)	326	sample cohort	01/07/2021 3:36 PM	01/07/2021 4:01 PM
	317	original cohort	12/21/2020 10:48 AM	01/07/2021 1:41 PM
	324	prolonged diabetes cohort [nested]	01/04/2021 12:22 PM	01/04/2021 12:58 PM
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	314	COPY OF: diabetes controlled cohort	12/11/2020 10:18 AM	12/11/2020 2:51 PM
	281	tandriano test	11/24/2020 12:16 PM	11/24/2020 4:49 PM
	279	heart failure outcome test v 0.1	11/23/2020 11:31 AM	11/23/2020 11:32 AM
	278	covid negative patients with heart failure test v 0.1	11/23/2020 11:27 AM	11/23/2020 11:28 AM
	277	covid positive patients with heart failure test v 0.1	11/23/2020 11:18 AM	11/23/2020 11:25 AM

Showing 1 to 15 of 124 entries Previous

3. Find the awful diabetes from the list and left click on it.

Cohort Definitions

Column visibility Copy CSV Show 15 entries

Showing 1 to 15 of 124 entries

	Id	Name	Created	Updated
▼ Last Modified				
2+ Weeks Ago (117)				
This Week (4)				
Last Week (3)				
▼ Author				
kjabbarymo (123)	329	awful diabetics	01/11/2021 9:31 AM	01/14/2021 2:25 PM
mginsber (1)	336	diabetes mellitus KJM	01/14/2021 11:13 AM	01/14/2021 2:24 PM
	330	covid intubated example	01/11/2021 4:20 PM	01/11/2021 4:20 PM

4. The awful diabetics cohort will open.

1 awful diabetics

Definition Concept Sets Generation Reporting Export IRB Messages

enter a cohort definition description here

2 Cohort Entry Events

Events having any of the following criteria:

a measurement of **hemoglobin a1c measurement**

occurrence start is **between** **2018-01-01** and **2018-12-31**

with value as number **Greater or Equal To** **8.5**

with continuous observation of at least **0** days before and **0** days after event index date

Limit initial events to: **earliest event** per person.

Restrict initial events

3 Inclusion Criteria

New inclusion criteria

Limit qualifying events to: **earliest event** per person.

4 Cohort Exit

Event Persistence: **end of continuous observation**


Censoring Events:

Exit Cohort based on the following criteria:

No censoring events selected.

5 Cohort Eras

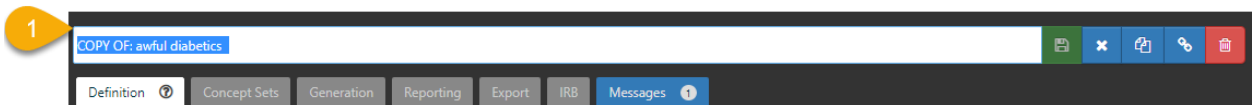
- Specify era collapse gap size: **0** days
- [add trimming options](#)

5. To copy the cohort right click on copy button 

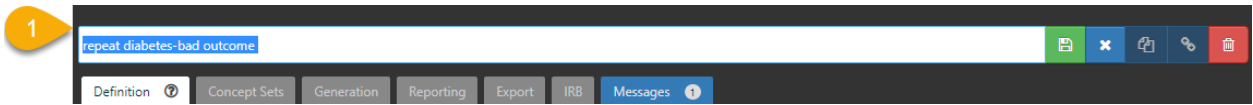
1 awful diabetics

Definition Concept Sets Generation Reporting Export IRB Messages

6. This creates another copy of our awful diabetes patients.



7. Rename this cohort to “repeat diabetes-bad outcome”.

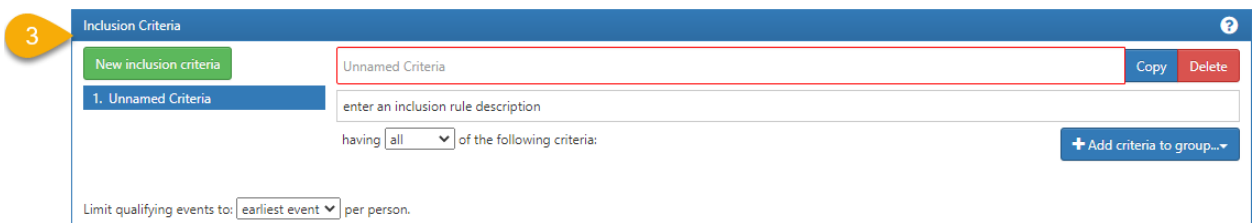


8. Now we want to add a follow up criterion of 6 to 12 months to our cohort in which we will search for a repeat hgba1c. After building the rule set with this additional criterion we will have a new cohort that has an initial awful diabetes hgba1c and then in 180 days to 365 days will have another hemoglobin a1c.

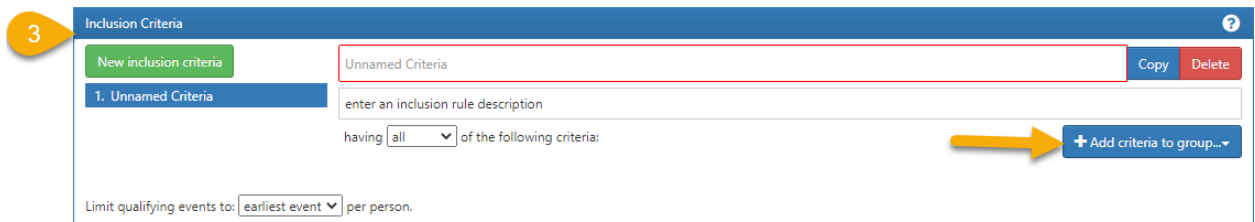
9. Notice **section 3**, click on the green tab **New inclusion criteria** **new inclusion criteria**.



10. A new window will open up in **section 3**.



11. Notice the **Add criteria to group** **+ Add criteria to group...** button on the right.



12. Click on the **Add criteria to group.**

Add Demographic

Filter events based on demographic criteria.

Add Condition Era

Find patients with specific condition era.

Add Condition Occurrence

Find patients with specific conditions.

Add Death

Find patients based on death.

Add Device Exposure

Find patients based on device exposure.

Add Dose Era

Find patients with dose eras.

Add Drug Era

Find patients with drug eras.

Add Drug Exposure

Find patients with exposure to specific drugs or drug classes.

Add Location Region

Find patients within geographical area.

Add Measurement

Find patients based on measurements.

Add Observation

Find patients based on observations.

Add Observation Period

Find patients based on observation periods.

Add Payer Plan Period

Find patients based on Payer Plan Period.

Add Procedure Occurrence

Find patients that experienced a specific procedure.

Add Specimen

Find patients based on specimen.

Add Visit

Find patients based on visit information.

Add Group

Add a group to combine criteria using and/or relationships.

13. Our goal is to capture a hemoglobin measurement repeat in 6 to 12 months.

14. Click on **Add Measurement**.

Add Drug Era
Find patients with drug eras.

Add Drug Exposure
Find patients with exposure to specific drugs or drug classes.

Add Location Region
Find patients within geographical area.

Add Measurement
Find patients based on measurements.

Add Observation
Find patients based on observations.

Add Observation Period
Find patients based on observation periods.

Add Payer Plan Period
Find patients based on Payer Plan Period.

Add Procedure Occurrence

15. A new box in **section 3** will appear.

The screenshot shows the 'Inclusion Criteria' interface. A new criteria box is highlighted with a yellow border and a yellow arrow pointing to it. The box contains the following configuration options:

- with **at least** **using all** occurrences of:
- a measurement of **Any Measurement**
- where **event starts** between **All** days **Before** and **All** days **After** **index start date** [add additional constraint](#)
- restrict to the same visit occurrence
- allow events from outside observation period

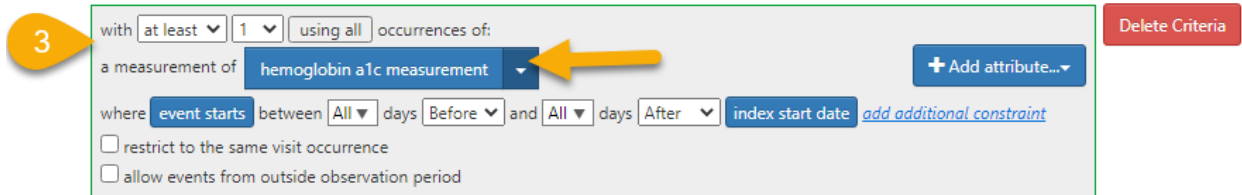
Limit qualifying events to: **earliest event** per person.

16. Notice the **Any measurement** and click on it. You can see that hemoglobin a1c concept is there. This is due to the fact that once you import a concept into a cohort it is available for reuse for any other inclusion criteria you add in the cohort.

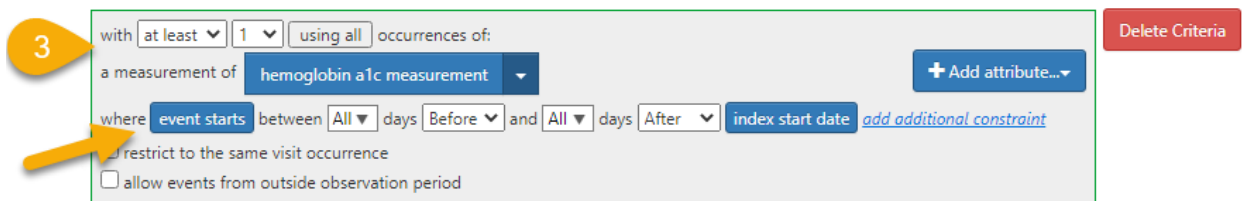
17.

The screenshot shows a close-up of the measurement selection dropdown menu. The selected option is **hemoglobin a1c measure...**. Other options visible include **Import Concept Set** and **Clear Concept Set**.

18. Left Click on hemoglobin a1c and note that the concept appears in what was before the “any measurement box”.



19. Next, we have to work on the follow up time. Notice the line below.



To be able to capture 6 to 12 months after measurement start date, we modify the line as below.

20. Click on “All” tab and set it to 180 days or just type 180.

with using all occurrences of:

a measurement of

where between days and days [add additional constraint](#)

restrict to the same visit occurrence
 allow events from outside observation period

per person.

21. Then, click on before and set it to **after**.

with using all occurrences of:

a measurement of

where between days and days [add additional constraint](#)

restrict to the same visit occurrence
 allow events from outside observation period

22. Type 365 in the third box with the word "All".

with using all occurrences of:

a measurement of

where between days and days [add additional constraint](#)

restrict to the same visit occurrence
 allow events from outside observation period

23. And leave the next tab **After** as it is.

24. We are looking at an interval of time that begins at the lab date that qualified the patient as an awful diabetic. We follow each individual patient from day 180 until day 365 after they qualified as an awful diabetic and ask whether there was a repeat Hgba1c in this interval. In effect, we are asking did the patient get minimally reasonable follow up care defined by at least testing for the control of diabetes in the 180-365 day window.

25. Notice the empty description box.

The screenshot shows the 'Inclusion Criteria' interface. A yellow circle with the number '3' is next to the 'New inclusion criteria' button. An arrow points to the 'Unnamed Criteria' text box. Another arrow points to the empty 'enter an inclusion rule description' text box. Below this, the criteria configuration is shown: 'having all' of the following criteria: 'with at least 1 using all occurrences of: a measurement of hemoglobin a1c measurement'. The 'where' clause is 'event starts between 180 days After and 365 days After index start date'. There are checkboxes for 'restrict to the same visit occurrence' and 'allow events from outside observation period'. At the bottom, it says 'Limit qualifying events to: earliest event per person.' Buttons for 'Copy', 'Delete', '+ Add criteria to group...', and 'Delete Criteria' are visible.

26. Name the criteria you just built and place it in the **unnamed criteria** box. This will allow you to understand what you have done when you return to this cohort in a month's time. I named it **repeat after 6 months to 12 months**.

The screenshot shows the 'Inclusion Criteria' interface after the criteria has been named. A yellow circle with the number '3' is next to the 'New inclusion criteria' button. An arrow points to the 'repeat after 6 months to 12 months' text box. Another arrow points to the '1. repeat after 6 months to 12 months' list item. The rest of the interface, including the configuration details and buttons, is identical to the previous screenshot.

27. The final look of the completed second inclusion criterion is as below.

3

Inclusion Criteria

New inclusion criteria repeat after 6 months to 12 months Copy Delete

1. repeat after 6 months to 12 months enter an inclusion rule description

having all of the following criteria: + Add criteria to group...

with at least 1 using all occurrences of:
 a measurement of hemoglobin a1c measurement + Add attribute...

where event starts between 180 days After and 365 days After index start date [add additional constraint](#)

restrict to the same visit occurrence
 allow events from outside observation period

Limit qualifying events to: earliest event per person. Delete Criteria

And the entire cohort made up of two criteria looks like this:

1

repeat diabetes-bad outcome Definition Concept Sets Generation Reporting Export IRB Messages

enter a cohort definition description here

2

Cohort Entry Events

Events having any of the following criteria:

a measurement of hemoglobin a1c measurement + Add attribute... Delete Criteria

✗ occurrence start is: Between 2018-01-01 and 2018-12-31

✗ with value as number Greater or Equal To 9.5

with continuous observation of at least 0 days before and 0 days after event index date

Limit initial events to: earliest event per person. Restrict initial events

3

Inclusion Criteria

New inclusion criteria repeat 6 months to 12 months Copy Delete

1. repeat 6 months to 12 months enter an inclusion rule description

having all of the following criteria: + Add criteria to group...

with at least 1 using all occurrences of:
 a measurement of hemoglobin a1c measurement + Add attribute...

where event starts between 180 days After and 365 days After index start date [add additional constraint](#)

restrict to the same visit occurrence
 allow events from outside observation period

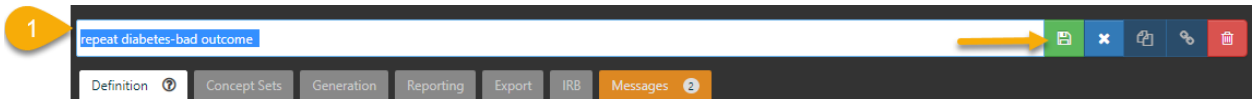
Limit qualifying events to: earliest event per person. Delete Criteria

28. Rename this cohort to “repeat diabetes-bad outcome”.

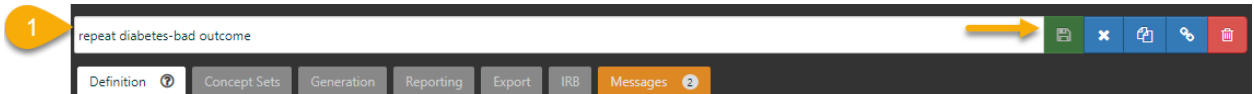
1

repeat diabetes-bad outcome Definition Concept Sets Generation Reporting Export IRB Messages

29. Click on save button



30. Notice the color changes from a light green to a darker shade of green letting us know that the cohort rule set has been saved.



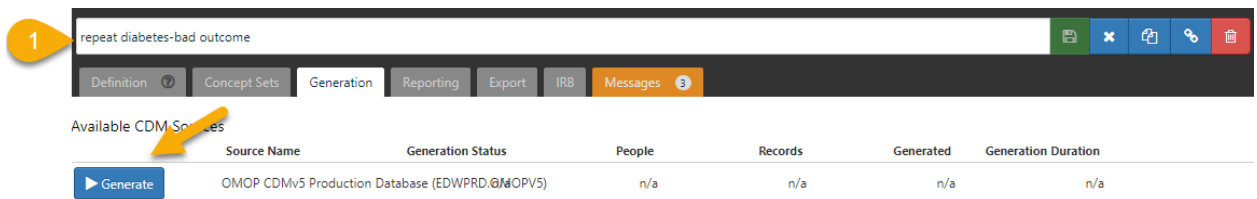
31. Let's generate the cohort and see how many people are in it.

32. In **section 1**, you will notice a greyed out **Generation** tab. left click on Generation to activate the tab turning it from gray to white.

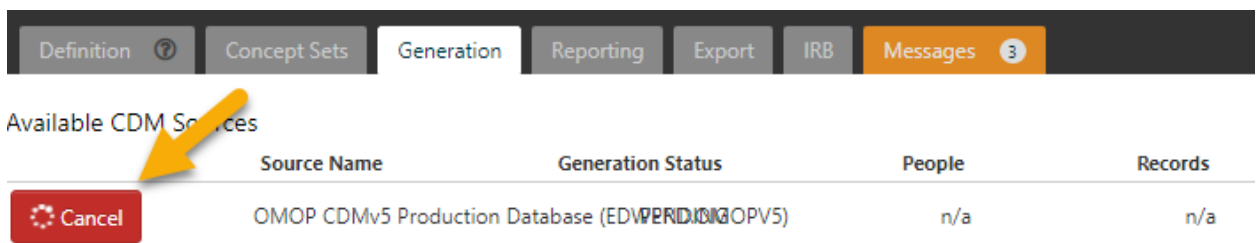


33. Under **Generation** tab a new window opens up. Click on **Generate**.

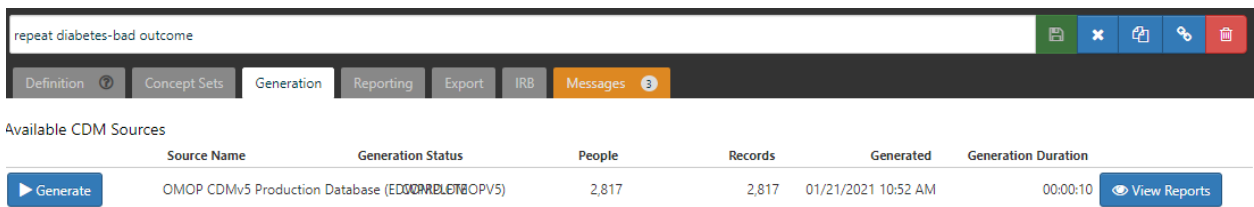
34.



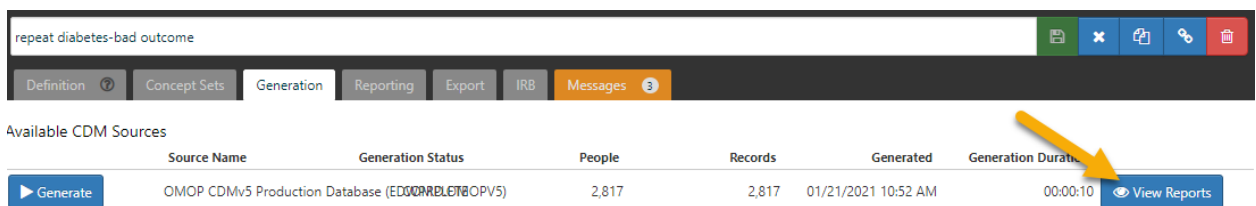
35. While atlas is working it turns the generate tab red and shows a wheel spinning



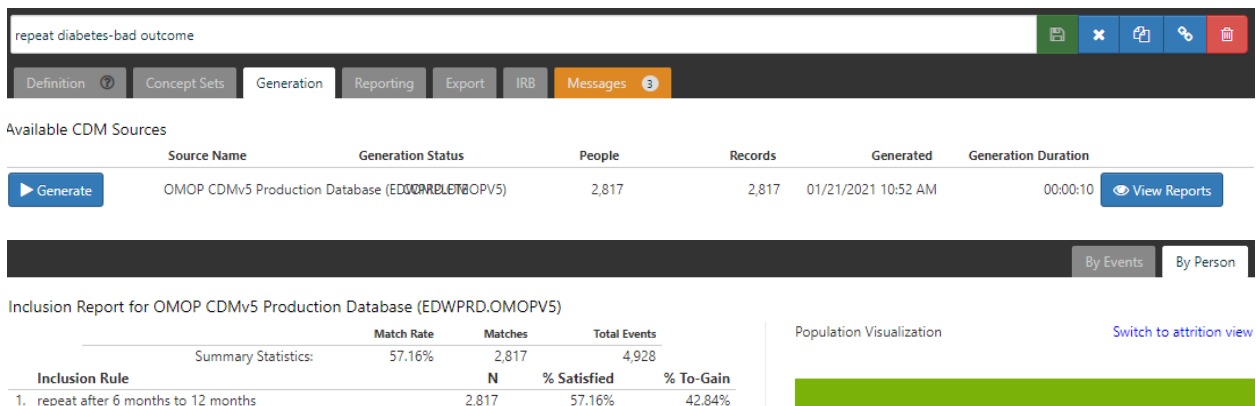
36. The red will turn blue and the word Generate will return when Atlas has finished its work.



37. click on the blue button will appear on the right with the word “view reports”
click on the view reports to see the result.



38. This results in the following image with the report appended below.



39. The generated result indicates out of the 4,929 patients who were initially identified as awful diabetics, 2,817 of them had a repeat hemoglobin a1c measurement in 180 days to 365 days after the initial test. In other words, 2,817(57 %) had follow up. But, disturbingly even though we were looking at truly awful diabetics, 42.84% were functionally ignored.

Now let' see of those who at least were not ignored and had a repeat study, how many of them had evidence of poor control? - a hgba1c >9?

To do this quickly, we will take advantage of all the work we have just done. We will copy the last cohort and modify it so that instead of just asking was there a repeat hgba1c, we will ask was the repeat hgba1c in this time window > 9?

1. To copy the cohort right click on copy button 



2. A copy of cohort will appear.



3. Rename and save it. I have called it **repeat diabetes > 9**.



4. The entire view appears as:

1 repeat diabetes > 9

Definition Concept Sets Generation Reporting Export IRB Messages

enter a cohort definition description here

2 Cohort Entry Events

Events having any of the following criteria:

+ Add Initial Event -

a measurement of hemoglobin a1c measurement + Add attribute... Delete Criteria

✗ occurrence start is: Between 2018-01-01 and 2018-12-31

✗ with value as number Greater or Equal To 9.5

with continuous observation of at least 0 days before and 0 days after event index date

Limit initial events to: earliest event per person.

Restrict initial events

3 Inclusion Criteria

New inclusion criteria repeat after 6 months to 12 months Copy Delete

1. repeat after 6 months to 12 months enter an inclusion rule description

having all of the following criteria: + Add criteria to group... Delete Criteria

with at least 1 using all occurrences of:

a measurement of hemoglobin a1c measurement + Add attribute... Delete Criteria

where event starts between 180 days After and 365 days After index start date add additional constraint

restrict to the same visit occurrence

allow events from outside observation period

Limit qualifying events to: earliest event per person.

5. We will only introduce minor changes to **Section 3**.

6. Let's focus on **section 3** and add a value as number for our hemoglobin a1c measurement.

3 Inclusion Criteria

New inclusion criteria repeat after 6 months to 12 months Copy Delete

1. repeat after 6 months to 12 months enter an inclusion rule description

having all of the following criteria: + Add criteria to group... Delete Criteria

with at least 1 using all occurrences of:

a measurement of hemoglobin a1c measurement + Add attribute... Delete Criteria

where event starts between 180 days After and 365 days After index start date add additional constraint

restrict to the same visit occurrence

allow events from outside observation period

Limit qualifying events to: earliest event per person.

7. Click on **Add attribute** on the right.

3

Inclusion Criteria

New inclusion criteria

repeat after 6 months to 12 months

Copy Delete

1. repeat after 6 months to 12 months

enter an inclusion rule description

having all of the following criteria:

+ Add criteria to group...

with at least 1 using all occurrences of:

a measurement of hemoglobin a1c measurement

+ Add attribute...

where event starts between 180 days After and 365 days After index start date add additional constraint

restrict to the same visit occurrence

allow events from outside observation period

Delete Criteria

Limit qualifying events to: earliest event per person.

8. From the drop-down menu select **Add value as number**.

+ Add attribute...

Add First Measure Criteria
Limit Measures to first occurrence in history.

Add Age at Occurrence Criteria
Filter Measurements by age at occurrence.

Add Gender Criteria
Filter Measurements based on Gender.

Add Measurement Date Criteria
Filter Measurements by Date.

Add Measurement Type Criteria
Filter Measurements by the Measurement Type.

Add Visit Criteria
Filter Measurements based on visit occurrence of measurement.

Add Operator Criteria
Filter Measurements by Operator.

Add Value as Number Criteria
Filter Measurements by Value as Number.

Add Value as Concept Criteria
Filter Measurements by Value as Concept.

Add Unit Criteria
Filter Measurements by the Unit.

9. In section 3 within the highlighted box a new line will appear.

Inclusion Criteria ?

3 New inclusion criteria repeat after 6 months to 12 months Copy Delete

1. repeat after 6 months to 12 months enter an inclusion rule description

having **all** of the following criteria: + Add criteria to group...▼

with **at least** **1** using **all** occurrences of:
 a measurement of **hemoglobin a1c measurement** + Add attribute...▼

✗ with value as number **Greater Than**

where **event starts** between **180** days **After** and **365** days **After** **index start date** [add additional constraint](#)

restrict to the same visit occurrence
 allow events from outside observation period

Delete Criteria

Limit qualifying events to: **earliest event** per person.

10. The default **value as number** is **greater than**, we only have to add a value of 9 to the empty box.

Inclusion Criteria ?

3 New inclusion criteria repeat after 6 months to 12 months Copy Delete

1. repeat after 6 months to 12 months enter an inclusion rule description

having **all** of the following criteria: + Add criteria to group...▼

with **at least** **1** using **all** occurrences of:
 a measurement of **hemoglobin a1c measurement** + Add attribute...▼

✗ with value as number **Greater Than** →

where **event starts** between **180** days **After** and **365** days **After** **index start date** [add additional constraint](#)

restrict to the same visit occurrence
 allow events from outside observation period

Delete Criteria

Limit qualifying events to: **earliest event** per person.

11. We want to make sure we are looking at the **earliest event** of a repeat measurement.

Inclusion Criteria ?

3 New inclusion criteria repeat after 6 months to 12 months Copy Delete

1. repeat after 6 months to 12 months enter an inclusion rule description

having **all** of the following criteria: + Add criteria to group...▼

with **at least** **1** using **all** occurrences of:
 a measurement of **hemoglobin a1c measurement** + Add attribute...▼

✗ with value as number **Greater Than**

where **event starts** between **180** days **After** and **365** days **After** **index start date** [add additional constraint](#)

restrict to the same visit occurrence
 allow events from outside observation period

Delete Criteria

Limit qualifying events to: **earliest event** per person

Cohort Exit **earliest event** →

all events
latest event

12. The default is on the **earliest event**.

Inclusion Criteria

New inclusion criteria

repeat after 6 months to 12 months

Copy Delete

1. repeat after 6 months to 12 months

enter an inclusion rule description

having all of the following criteria:

+ Add criteria to group...

with at least 1 using all occurrences of:

a measurement of hemoglobin a1c measurement

+ Add attribute...

with value as number Greater Than 9

where event starts between 180 days After and 365 days After index start date

restrict to the same visit occurrence

allow events from outside observation period

Delete Criteria

Limit qualifying events to: earliest event per person.

13. The final look of our new inclusion criteria is as below.

Inclusion Criteria

New inclusion criteria

repeat after 6 months to 12 months

Copy Delete

1. repeat after 6 months to 12 months

enter an inclusion rule description

having all of the following criteria:

+ Add criteria to group...

with at least 1 using all occurrences of:

a measurement of hemoglobin a1c measurement

+ Add attribute...

with value as number Greater Than 9

where event starts between 180 days After and 365 days After index start date

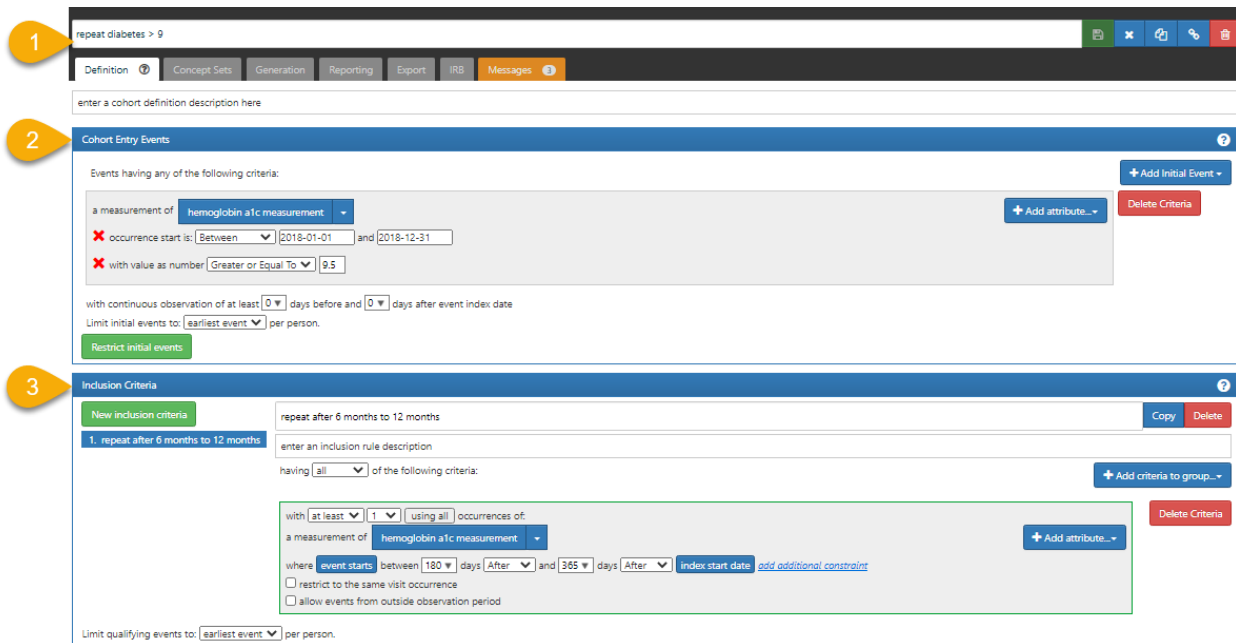
restrict to the same visit occurrence

allow events from outside observation period

Delete Criteria

Limit qualifying events to: earliest event per person.

14. The cohort should look like:

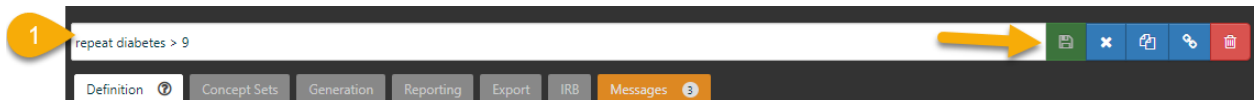


15. Now we want to save this new cohort.

16. Go to **section 1**, save the new changes by clicking on the bright save button as before.



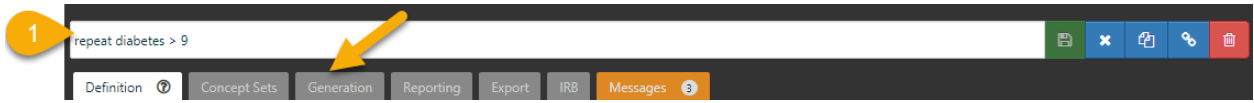
17. When the save button changes its color to lighter green we can continue.



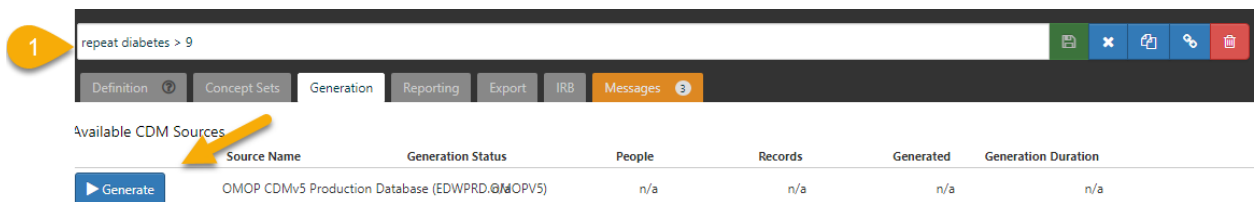
18. Now we want to see how many people qualify for the cohort using these cohort rules.

19. Let's generate the cohort and see how many people are in it.

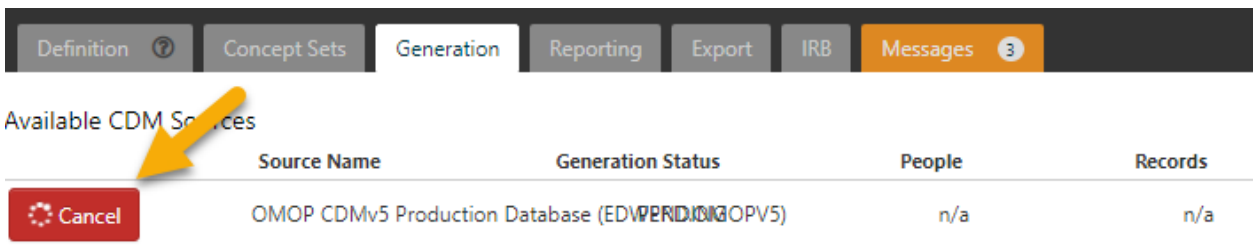
20. In **section 1**, you will notice a greyed out **Generation** left click on generate to activate the tab. (use my same language)



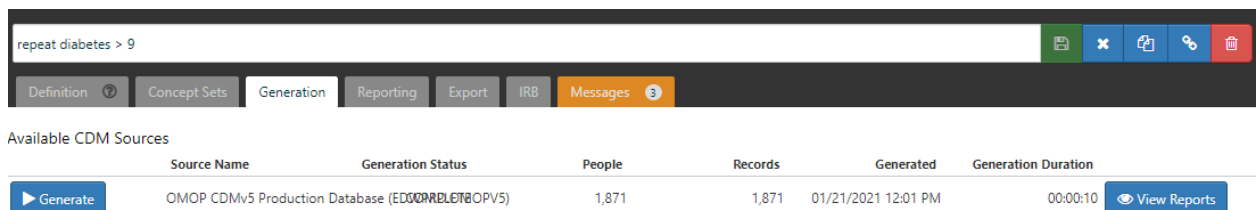
20. Under **Generation** tab a new window opens. Click on **Generate**.



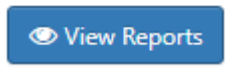
21. While Atlas is working it turns the generate tab red and shows a wheel spinning.



22. The red will turn blue and the word Generate will return when Atlas has finished its work.



23. Click on the blue button will appear on the right with the word “view reports” click on the view reports to see the result.



Source Name	Generation Status	People	Records	Generated	Generation Duration	
OMOP CDMv5 Production Database (EDWPRD.OMOPV5)	COMPLETE	1,871	1,871	01/21/2021 12:01 PM	00:00:10	View Reports

24. This results in the following image with the report appended below.

Inclusion Report for OMOP CDMv5 Production Database (EDWPRD.OMOPV5)

Summary Statistics:		Match Rate	Matches	Total Events
		37.96%	1,871	4,929
Inclusion Rule	N	% Satisfied	% To-Gain	
1. repeat after 6 months to 12 months	1,871	37.96%	62.04%	

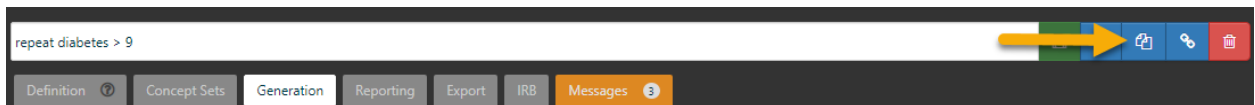
The result indicates out of the total number of patients, 4,929 existing in this cohort, 1,871 of them had a hemoglobin a1c greater than 9 within 6 months to 12 months of their repeat.

To summarize, of our original awful cohort 43% did not even have a repeat study. Of those with a repeat study, 38% had horrible outcome.

Now, let’s see how many patients achieved a good outcome hgba1c < 7?

We will use the same trick of copying the last cohort to modify the value we are seeking in the window of 180 to 365 days.

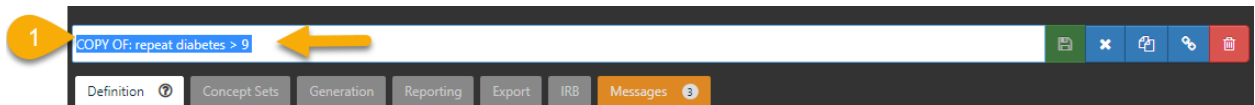
Click on copy button  from top right once more.



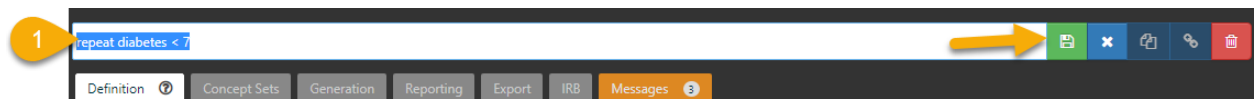
Available CDM Sources

	Source Name	Generation Status	People	Records	Generated	Generation Duration	
	OMOP CDMv5 Production Database (EDDORRBL6T8OPV5)		1,871	1,871	01/21/2021 12:01 PM	00:00:10	

1. A copy of cohort will show up.



2. Rename and save it. I have named it **repeat diabetes < 7**.



3. notice the window in section 3.

1. repeat diabetes < 7

2. Cohort Entry Events

Events having any of the following criteria:

- a measurement of **hemoglobin a1c measurement**
 - occurrence start is: **Between** and
 - with value as number **Greater or Equal To**

with continuous observation of at least days before and days after event index date
 Limit initial events to **earliest event** per person.

3. Inclusion Criteria

repeat after 6 months to 12 months

1. repeat after 6 months to 12 months

having **all** of the following criteria:

- with **at least** using **all** occurrences of:
 - a measurement of **hemoglobin a1c measurement**
- where **event starts** between days **After** and days **After** **index start date** [add additional constraint](#)
- restrict to the same visit occurrence
- allow events from outside observation period

Limit qualifying events to **earliest event** per person.

4. In **section 3** change the **greater than** to **less than** first.

5. Then, change the value to **less than 7**.

The screenshot shows the 'Inclusion Criteria' interface. At the top, there is a blue header with a question mark icon. Below it, a green button labeled 'New inclusion criteria' is next to a text input field containing 'repeat after 6 months to 12 months'. To the right of this field are 'Copy' and 'Delete' buttons. Below this, a blue button labeled '1. repeat after 6 months to 12 months' is next to another text input field for 'enter an inclusion rule description'. Below that, a dropdown menu is set to 'all' with the text 'having all of the following criteria:'. To the right is a '+ Add criteria to group...' button. A red 'Delete Criteria' button is on the far right. The main area is a light gray box containing the criteria configuration. It starts with 'with at least 1 using all occurrences of:'. Below this is 'a measurement of hemoglobin a1c measurement' with a '+ Add attribute...' button. The next line is 'with value as number Greater Than 9', where a red 'X' is to the left and a yellow arrow points to the 'Greater Than' dropdown. Below this is 'where event starts between 180 days After and 365 days After index start date' with an 'add additional constraint' link. There are two checkboxes: 'restrict to the same visit occurrence' and 'allow events from outside observation period'. At the bottom left, it says 'Limit qualifying events to: earliest event per person.'

6. Click on the bar besides **greater than** and set the value to **less than**.

This screenshot is similar to the previous one, but the dropdown menu for 'with value as number' is open. The menu options are: 'Less Than' (highlighted in blue), 'Less or Equal To', 'Equal To', 'Greater Than', 'Greater or Equal To', 'Between', and 'Not Between'. A yellow arrow points to the 'Less Than' option. The rest of the interface remains the same as in the previous screenshot.

7. Next change the value from **9 to 7**.

3

Inclusion Criteria

New inclusion criteria repeat after 6 months to 12 months Copy Delete

1. repeat after 6 months to 12 months enter an inclusion rule description

having all of the following criteria: + Add criteria to group...

with at least 1 using all occurrences of:

a measurement of hemoglobin a1c measurement + Add attribute...

with value as number Less Than 7

where event starts between 180 days After and 365 days After index start date add additional constraint

restrict to the same visit occurrence

allow events from outside observation period

Delete Criteria

Limit qualifying events to: earliest event per person.

8. Make sure the qualifying event is set to **earliest event** as before.

3

Inclusion Criteria

New inclusion criteria repeat after 6 months to 12 months Copy Delete

1. repeat after 6 months to 12 months enter an inclusion rule description

having all of the following criteria: + Add criteria to group...

with at least 1 using all occurrences of:

a measurement of hemoglobin a1c measurement + Add attribute...

with value as number Less Than 7

where event starts between 180 days After and 365 days After index start date add additional constraint

restrict to the same visit occurrence

allow events from outside observation period

Delete Criteria

Limit qualifying events to: earliest event per person.

Cohort Exit

all events

earliest event

latest event

9. Here is the final look of **section 3**.

3 Inclusion Criteria

New inclusion criteria repeat after 6 months to 12 months Copy Delete

1. repeat after 6 months to 12 months enter an inclusion rule description

having all of the following criteria: + Add criteria to group...

with at least 1 using all occurrences of:
 a measurement of hemoglobin a1c measurement + Add attribute...
 ✗ with value as number Less Than 7
 where event starts between 180 days After and 365 days After index start date [add additional constraint](#)
 restrict to the same visit occurrence
 allow events from outside observation period

Delete Criteria

Limit qualifying events to: earliest event per person.

10. Here is the final look of our cohort

1 repeat diabetes < 7

Definition Concept Sets Generation Reporting Export IRB Messages

enter a cohort definition description here

2 Cohort Entry Events

Events having any of the following criteria: + Add Initial Event -

a measurement of hemoglobin a1c measurement + Add attribute... Delete Criteria

✗ occurrence start is: Between 2018-01-01 and 2018-12-31

✗ with value as number Greater or Equal To 9.5

with continuous observation of at least 0 days before and 0 days after event index date

Limit initial events to: earliest event per person.

Restrict initial events

3 Inclusion Criteria

New inclusion criteria repeat after 6 months to 12 months Copy Delete

1. repeat after 6 months to 12 months enter an inclusion rule description

having all of the following criteria: + Add criteria to group...

with at least 1 using all occurrences of:
 a measurement of hemoglobin a1c measurement + Add attribute...
 ✗ with value as number Less Than 7
 where event starts between 180 days After and 365 days After index start date [add additional constraint](#)
 restrict to the same visit occurrence
 allow events from outside observation period

Delete Criteria

Limit qualifying events to: earliest event per person.

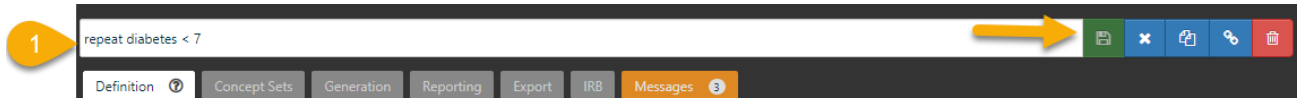
11. From section 1, save the new changes as before.

1 repeat diabetes < 7

Definition Concept Sets Generation Reporting Export IRB Messages

Save button highlighted with orange arrow

12. Save button turns dim and we have our cohort built.

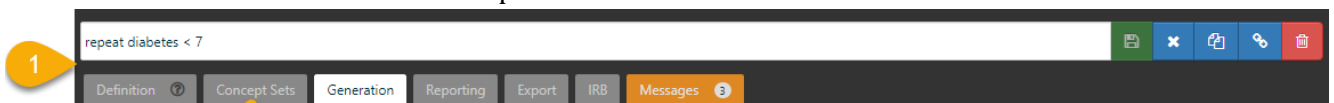


13. Let's build or generate the cohort and see how many people are in it.

14. In **section 1**, you will notice a greyed out **Generation** left click on generate to activate the tab.

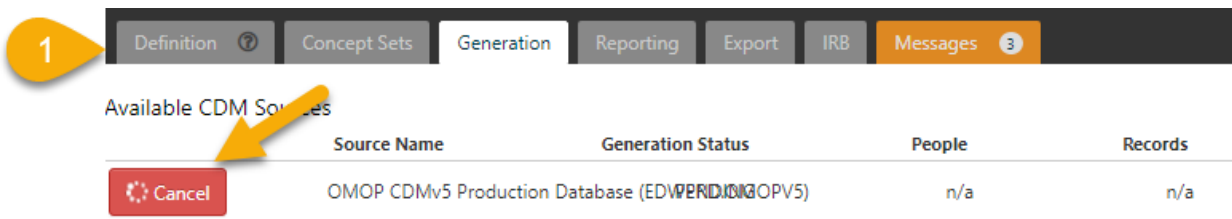


25. Under **Generation** tab a new window opens. Click on **Generate**.



26. While atlas is working it turns the generate tab red and shows a wheel spinning.

Source Name	Generation Status	People	Records	Generated	Generation Duration
OMOP CDMv5 Production Database (EDWPRD.OMOPV5)	Generating	n/a	n/a	n/a	n/a



27. The red will turn blue and the word Generate will return when Atlas has finished its work.

Source Name	Generation Status	People	Records	Generated	Generation Duration
OMOP CDMv5 Production Database (EDWPRD.OMOPV5)	COMPLETE	304	304	01/20/2021 11:22 AM	00:00:09

28. click on the blue button will appear on the right with the word “view reports”



. click on the view reports to see the result.

Source Name	Generation Status	People	Records	Generated	Generation Duration
OMOP CDMv5 Production Database (EDWPRD.OMOPV5)	COMPLETE	304	304	01/20/2021 11:22 AM	00:00:09

29. This results in the following image with the report appended below.

Source Name	Generation Status	People	Records	Generated	Generation Duration
OMOP CDMv5 Production Database (EDWPRD.OMOPV5)	COMPLETE	304	304	01/20/2021 11:22 AM	00:00:09

Inclusion Report for OMOP CDMv5 Production Database (EDWPRD.OMOPV5)			
	Match Rate	Matches	Total Events
Summary Statistics:	6.17%	304	4,929
Inclusion Rule		N	% Satisfied
1. repeat after 6 months to 12 months-good outcome		304	6.17%
			93.83%

30. The result indicates out of the 4,929 awful diabetics only, 304(6.17%) demonstrated a good outcome of hgba1c <7.

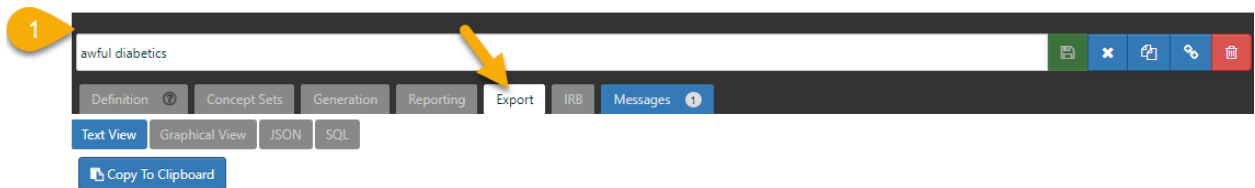
Part IV. Sharing cohorts

Next, we want to share our cohort with an associate. We can work with internal collaborators here at Montefiore/Einstein, or anyone who currently has access to Atlas at another institution.

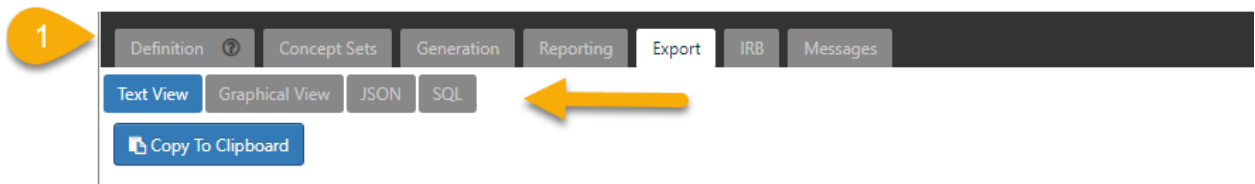
Sharing is very easy. Atlas records the cohort rules in two distinct programming languages, JSON and SQL. When you want to share a cohort with a colleague you copy the set of code and paste it – the easiest way to do this is through email, but you can also store in a document and share that way. Once the code is shared, the recipient may input the code for your unique cohort into their own Atlas account.

For any cohort sharing follow the steps below:

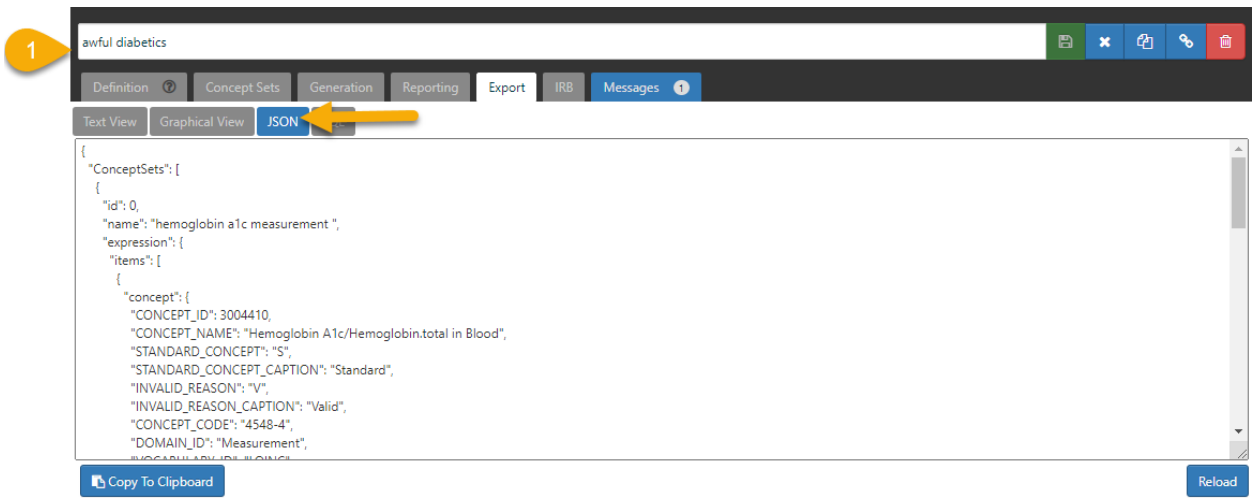
1. From the section 1, click on export tab.



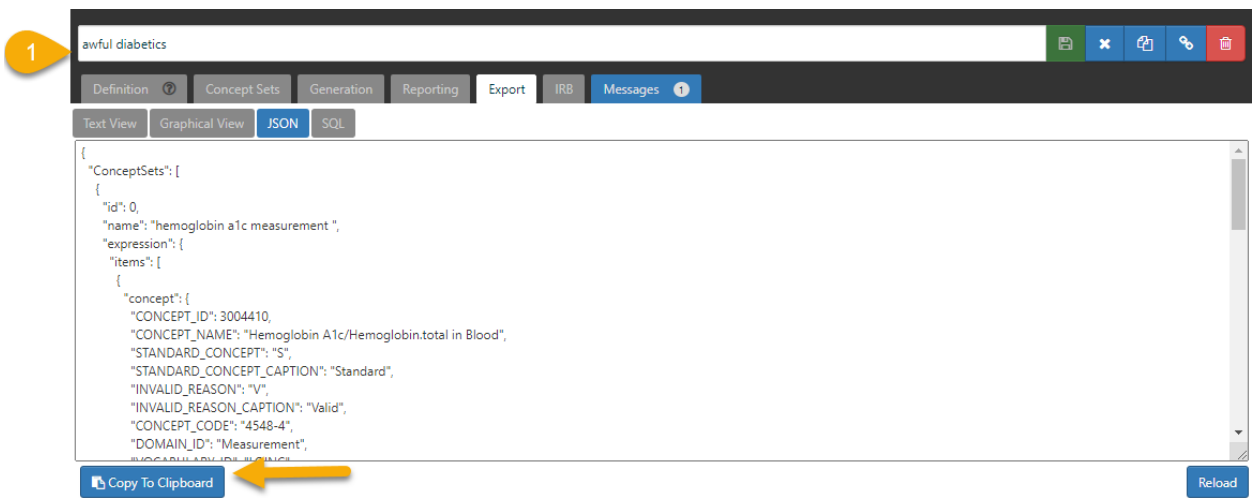
2. A window opens, notice the grey tabs.



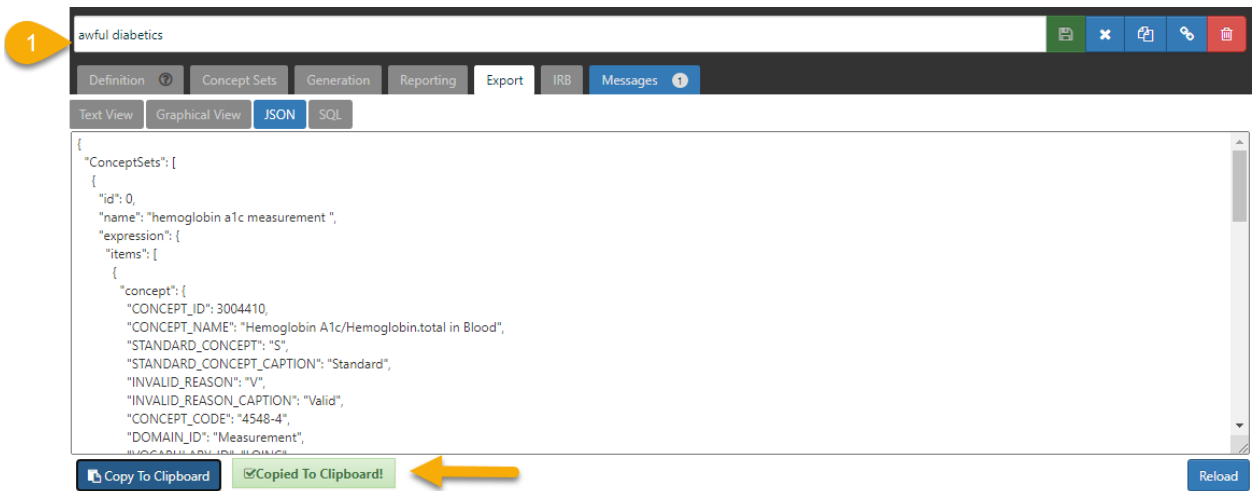
3. Click on JSON tab.



4. Click on copy to clipboard, this copies your code.



5. Notice the green notification. Your cohort is copied.



6. Paste in an email message to your colleague and he will be able to use this to rebuild your cohort on his version of Atlas.

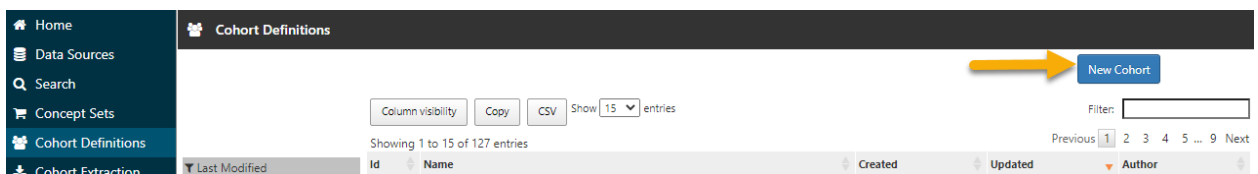
7. On top right, click on  to close the current cohort.

8. Let's assume you have sent the JSON code to a colleague and they have copied it to their clipboard.

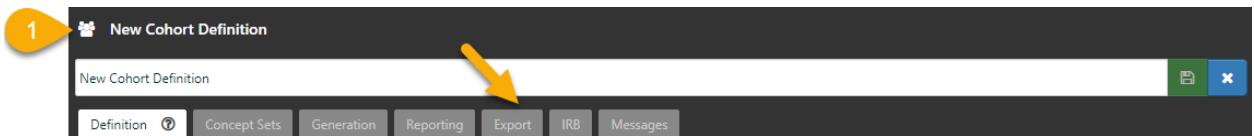
9. Now they open Atlas

Here are the additional steps they would need to do.

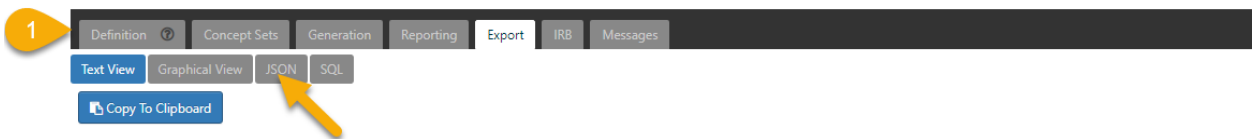
10. In cohort definition tab, click on the **new cohort** tab on the right.



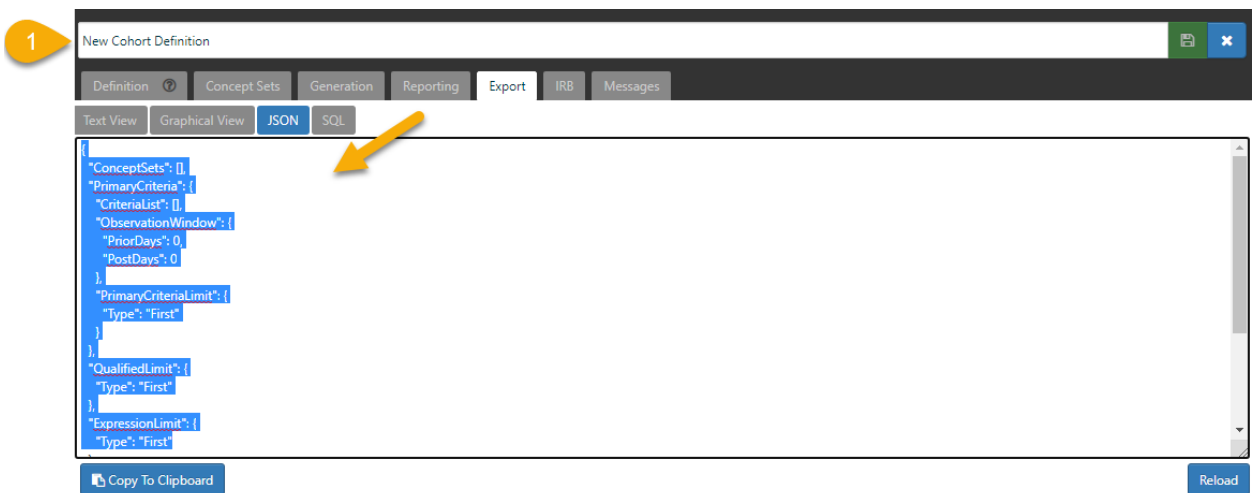
11. There is no import tab, so open the Export tab.



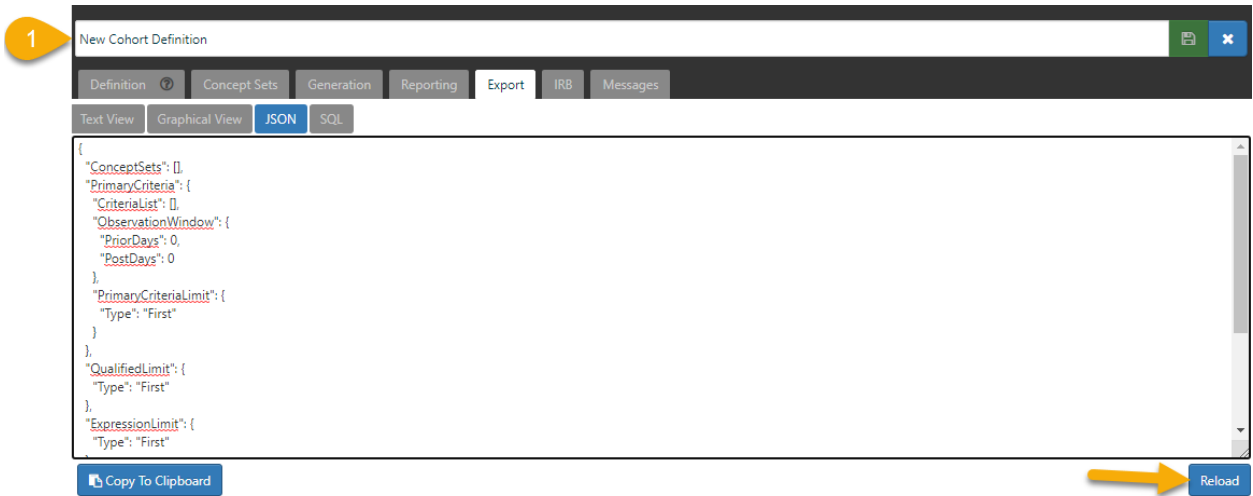
12. Click on JSON.



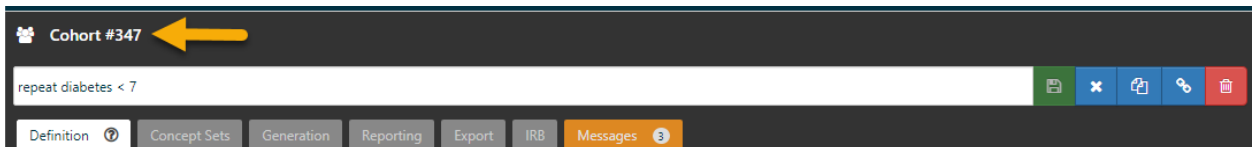
13. Paste the script here.



14. Click on **reload** on the right.



15. The cohort will be generated. Name it and save it.
16. In order to have someone from the atlas team provide you with MRN's you will send an email to atlas-help@montefiore.org with the cohort definition number.
17. You will need to specify the cohort number as shown in the image below and that you intend to access MRN's for you work. Please also reference the IRB number of your approved study.



- 18.
19. Finally, you will need to designate that you have completed the introductory training and the date at which you've completed the work.

Congratulations!