Learner's Guide to Validation Rules (Use)

What is this guide?

This guide contains all exercises and detailed steps to perform them related to the use of validation rules session for the Analytics Tools Level 1 academy. Please perform each of the exercises when prompted by your instructors.

Learning objectives for this session

1. Understand some of the key principles associated with data quality
2. Define what a validation rule in DHIS2 is
3. Understand how validation rules can be used to measure consistency in DHIS2
4. Execute validation rule review in data entry
5. Execute validation rule review in bulk via validation analysis
6. Describe how validation rules can be compared against calculated thresholds
7. Execute validation rule analysis using validation rules with defined thresholds

Time needed for this session

Live demo: 4 demos/presentations, ~ 20 mins each

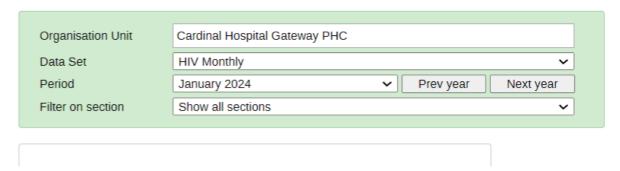Hands-on activities: 4 activities, ~ 15 mins each

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Exercise 1 - Review validation rules in data entry

In the first example, we will run the validation rules for the [HIV Monthly] data set.

Select the following in data entry:
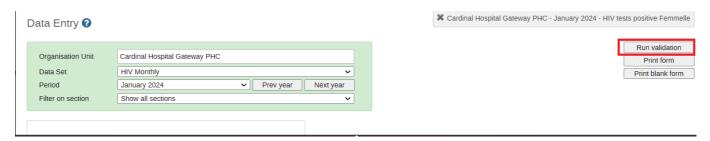

First, review the data entry page briefly. We will start by running logical rules, which are checking the correctness of the data. These rules will essentially tell us if the data should be fixed based on the output it provides.

There are several places you can check if your data entry page passes the configured validation rules.
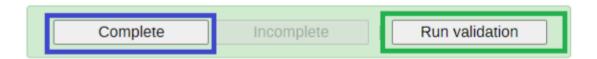
At the top right corner:

At the bottom of the page:

Sex

Filter in section	Male	Female
HIV tests performed	11	15
HIV tests positive	119	163
HIV tests positive < 1 years	5	5
PLHIV currently on ART	735	1077
PLHIV new on ART	2	3
PLHIV new on ART < 1 years	1	1
PLHIV retained on ART last 12 months	2	3
PLHIV retained on ART last 12 months < 1 years	1	1
PLHIV started ART 12 months ago	2	3
PLHIV virologically suppressed		
PLHIV with viral load tests		

Complete	Incomplete	Run validation

To get the validation rules to trigger, make sure you update the values so that HIV tests positive > HIV tests performed. You will see an example of this in the above image.

Note: The validation will run everytime you click on complete. You can explain the complete button, in that it contributes to two of the factors of data quality previously discussed: the completeness and timeliness of the data. When selecting the complete button, the dataset registers as being complete (data is saved automatically as it is entered, complete does not save the data). The date in which the complete button is selected is used to compare against the defined timeliness of the dataset. So if my timeliness is defined as having the data submitted within 15 days of the next month, and I click complete on March 8 for February data, the dataset will be complete for February as well as timely!

After reviewing these concepts and altering the data within data entry, run the validation rule(s)

Review the rules in data entry

After you run the rules, review them. This will help you to identify any issues with the data currently. The validation rules are pointing us to where there are problems in our data. Close the results page and review the data entry screen to verify what is being calculated.
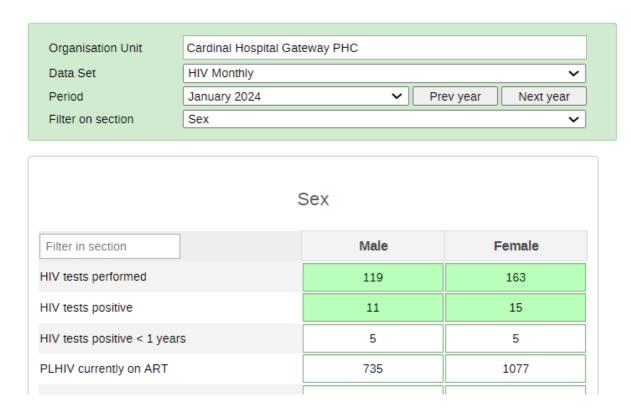
The first and second values are being taken from the sex section HIV tests performed and HIV tests positive categorized by gender/sex (Female and Male).

Reviewing our data, this means that one of these values must be incorrect. We may need to verify with the facility, but let us assume this has already been done and we understand the HIV tests positive were counted incorrectly.

We can update this to each cell respectively as shown in the image respectively and Run the validation again.

It should now pass as the number of HIV tests positive is now less than the HIV tests performed in this period.

Exercise 2 - Run a validation rule in validation rule analysis

In order to run validation rule analysis, go to the data quality app and select "Run validation"

Select Animal Region and run the HIV validation rules rules from January - April 2024

Validation Rule Analysis ❓

Parent organisation unit		Start date

Parent organisation unit

- ▼ Trainingland
  - ▶ **Animal Region**
  - ▶ Food Region

Start date

2024-01-01

End date

2024-04-01
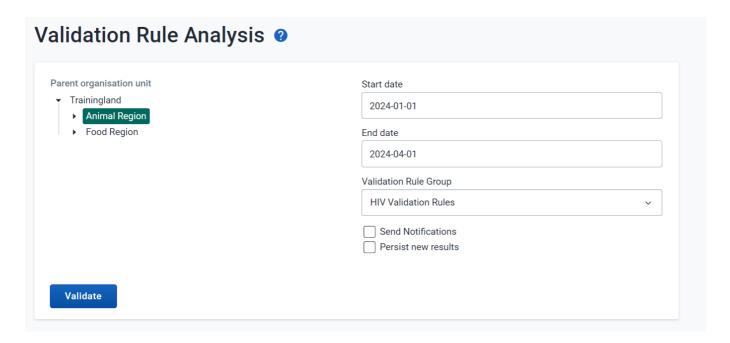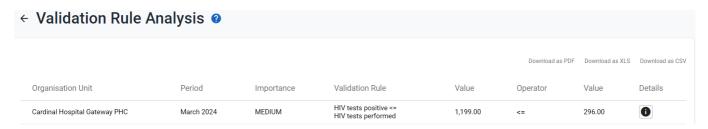
Validation Rule Group

HIV Validation Rules ⌄

☐ Send Notifications
☐ Persist new results

Validate

Once you have selected the inputs select "Validate"

← **Validation Rule Analysis** ❓

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Organisation Unit	Period	Importance	Validation Rule	Value	Operator	Value	Details
Cardinal Hospital Gateway PHC	March 2024	MEDIUM	HIV tests positive <= HIV tests performed	1,199.00	<=	296.00	ⓘ

Review the validation details

There is only validation violation in Cardinal Hospital in March 2024. Select the details button of one of the violations so you can see in more detail what the issue is.

The validation details show all of the data elements that are part of the validation rule along with their values. In this example, the total number of HIV tests positive should be <= the total HIV tests performed.

Therefore, HIV tests positive (1199) > Total HIV tests performed (296), not less than or equal to the number of tests performed, hence the identification of a violation.

We can see how this view will be useful in reviewing the violations for multiple org units at once, as we can also see all the component parts of the violation. This can allow us to potentially identify exactly which value is incorrect.

Exercise 3 - Examples with mathematical operations

Select the following in data entry:

First, review the data entry page briefly. We will start by running logical rules, which are checking the correctness of the data. These rules will essentially tell us if the data should be fixed based on the output it provides.
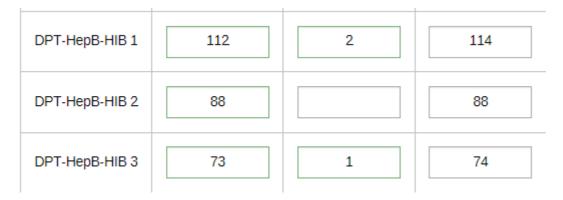
Run the validation rules as you did before.

Validation

Validation Result ⚠

The data entry screen has the following validation errors, please correct

Validation rule	Left side	Operator	Right side
DPT-HepB-Hib doses given should be less than total used and wasted	276.0	<=	271.0

Review the rules in data entry

This will help you to identify any issues with the data currently. The validation rules are pointing us to where there are problems in our data. Close the results page and review the data entry screen to verify what is being calculated.

The first value is being taken from the total number of DPT doses that are administered.
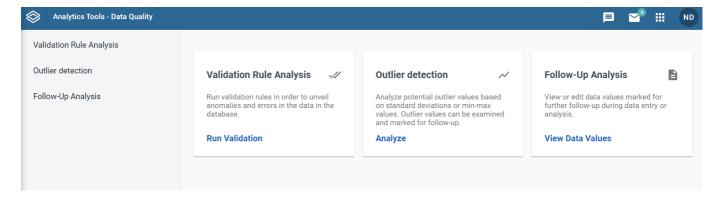

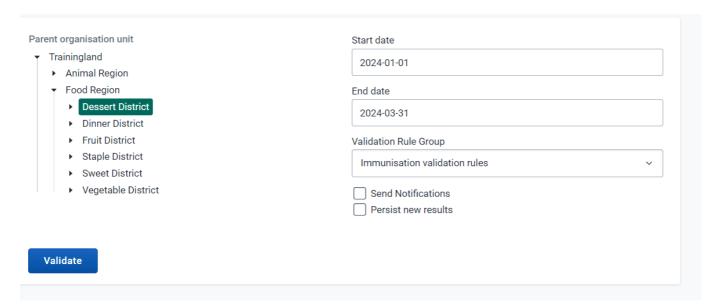The second value is being taken from our stock section

Reviewing our data, this means that one of these values must be incorrect. We may need to verify with the facility, but let us assume this has already been done and we understand the received balance was counted incorrectly.
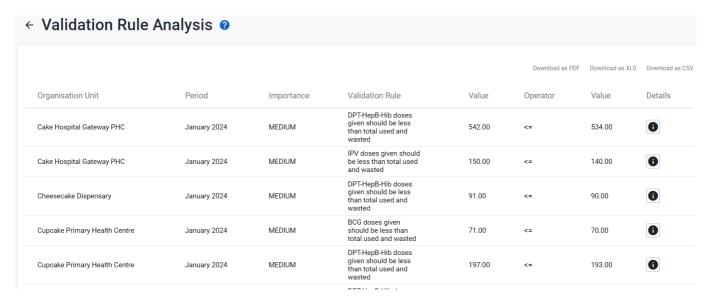
Run Validation Analysis

In order to run validation rule analysis, go to the data quality app and select "Run validation"

Run the validaiton analysis if Dessert District from January - March 2024 using the "Immunisation validation rules" group.

Once you have selected the inputs select "Validate"

Review the validation details

You should see a number of violations during this period. Select the details button of one of the violations so you can see in more detail what the issue is. This example is Cake Hospital Gateway PHC in January 2024.

LEFT SIDE

DATA ELEMENT	VALUE
EPI - DPT-HepB-HIB 1 doses given < 1 year	177.00
EPI - DPT-HepB-HIB 1 doses given ≥ 1 year	1.00
EPI - DPT-HepB-HIB 2 doses given < 1 year	154.00
EPI - DPT-HepB-HIB 2 doses given ≥ 1 year	3.00
EPI - DPT-HepB-HIB 3 doses given < 1 year	138.00
EPI - DPT-HepB-HIB 3 doses given ≥ 1 year	-

RIGHT SIDE

DATA ELEMENT	VALUE
EPI - DPT-HepB-HIB VVM	-
EPI - DPT-HepB-HIB broken	-
EPI - DPT-HepB-HIB ending balance	2,406.00
EPI - DPT-HepB-HIB expired	-
EPI - DPT-HepB-HIB frozen	-
EPI - DPT-HepB-HIB missing	-
EPI - DPT-HepB-HIB received	-
EPI - DPT-HepB-HIB starting balance	2,872.00

Close

The validation details show all of the data elements that are part of the validation rule along with their values. In this example, the total number of DPT doses given should be <= the total used and wasted.

1. The total DPT doses = 177+1+154+3+138= 473
2. Total used and wasted = 2872-2406 = 466

Therefore, DPT doses (473) > Total used and wasted (466), not less than or equal to the number used and wasted, hence the identification of a violation. If we altered our starting balance to be higher basd on our assumption, then we could remove this violation.

We can see how this view will be useful in reviewing the violations for multiple org units at once, as we can also see all the component parts of the violation. This can allow us to potentially identify exactly which value is incorrect.
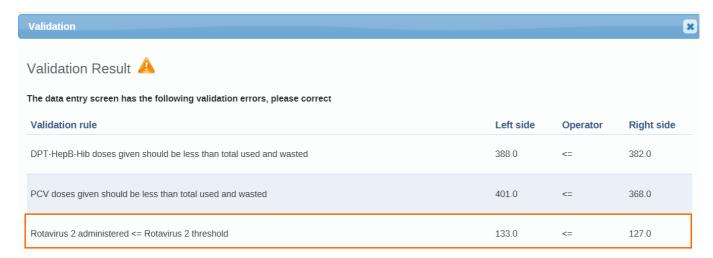
Exercise 4 - Run the validation rule using a threshold in data entry

This should be done after presenting slide 14 in the presentation.

Select the following in data entry

Data Entry ❓

Organisation Unit	Beetle Health Centre
Data Set	Immunisation
Period	January 2024 Prev year Next year

Run the validation rule and review the results

Validation   ✖

Validation Result ⚠️

The data entry screen has the following validation errors, please correct

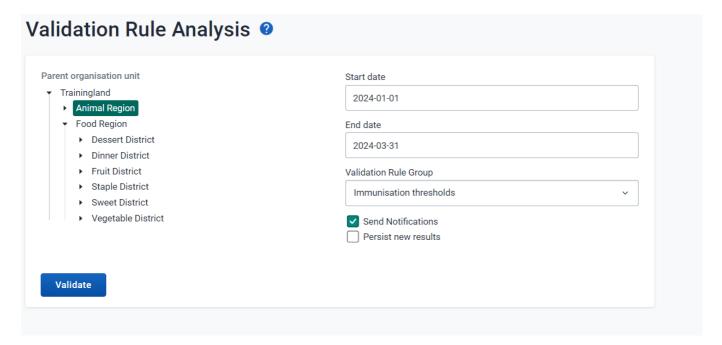| Validation rule	Left side	Operator	Right side
DPT-HepB-Hib doses given should be less than total used and wasted	388.0	<=	382.0
PCV doses given should be less than total used and wasted	401.0	<=	368.0
Rotavirus 2 administered <= Rotavirus 2 threshold	133.0	<=	127.0

Note that it runs both the logical rules, which we have already reviewed, as well as the rules that check consistency using outliers that have been generated via the predictor function in this case. These rules can run using outliers that have been imported into the system as well if required.

Exercise 5 - Run the "Immunisation thresholds" validation rules in validation rule analysis
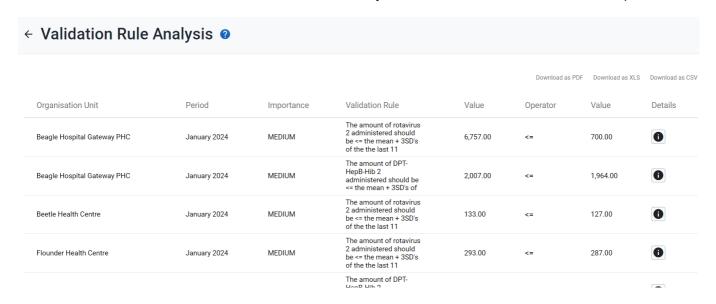
Perform this after finishing the presentation.

In Validation Rule Analysis, select:

- Org Unit: Animal Region
- Period: January 1 - March 31 2024
- Validation Rule Group : Immunisation thresholds
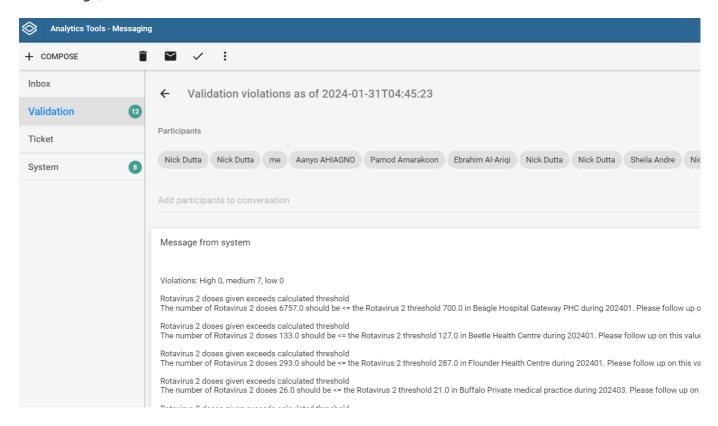- Ensure the send notifications option is selected

We will run the rules and also send the notifications for any identified violations. Select validate to proceed.

As we sent the notification out, we will also receive this via the messages app and potentially e-mail as well if this has been configured.

Check the messages app

Navigate to the messages app and review the validation violations that have been sent. You will have a small notification that there are new validation rule messages in your messages inbox (the number within the circle in this image).

This message will be sent to multiple users. Who receives this message is dependent on the configuration.