

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

Table of Contents/Quick Guide

- [Learner's Guide to Validation Rules \(Use\)](#)
- [What is this guide?](#)
- [Learning objectives for this session](#)
- [Time needed for this session](#)
- [Table of Contents/Quick Guide](#)
- [Hands On Activities](#)
 - [Exercise 1 - Review validation rules in data entry](#)
 - [Review the rules in data entry](#)
 - [Exercise 2 - Run a validation rule in validation rule analysis](#)
 - [Review the validation details](#)
 - [Exercise 3 - Examples with mathematical operations](#)
 - [Review the rules in data entry](#)
 - [Run Validation Analysis](#)
 - [Review the validation details](#)
 - [Exercise 4 - Run the validation rule using a threshold in data entry](#)
 - [Exercise 5 - Run the "Immunisation thresholds" validation rules in validation rule analysis](#)

■ [Check the messages app](#)

Hands On Activities

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:

Data Entry ?

✕ Car

Organisation Unit

Cardinal Hospital Gateway PHC

Data Set

HIV Monthly

Period

January 2023

Prev year

Next year

Filter on section

Show all sections

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:

Data Entry ?

✕ Cardinal Hospital Gateway PHC - January 2023 - No Data Element Selected

Organisation Unit

Cardinal Hospital Gateway PHC

Data Set

HIV Monthly

Period

January 2023

Prev year

Next year

Filter on section

Show all sections

Run validation

Print form

Print blank form

HIV Monthly

Filter in section

	Value
ANC clients newly tested HIV positive and started on ART	1
ANC clients that are HIV+ and on ART	10

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)

Validation



Validation Result

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

Validation rule	Left side	Operator	Right side
HIV - HIV tests positive Male+HIV - HIV tests positive Female <= HIV - HIV tests performed Male+HIV - HIV tests performed Female	282.0	<=	26.0

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).

Data Entry ?

Organisation Unit

Cardinal Hospital Gateway PHC

Data Set

HIV Monthly

Period

January 2023

Prev year

Next year

Filter on section

Sex

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 never on ART	2	2

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.

Data Entry ?

Organisation Unit

Cardinal Hospital Gateway PHC

Data Set

HIV Monthly

Period

January 2023

Prev year

Next year

Filter on section

Sex

Sex

Filter in section	Male	Female
HIV tests performed	119	163
HIV tests positive	11	15
HIV tests positive < 1 years	5	5

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"

Analytics Tools - Data Quality

Validation Rule Analysis

Outlier detection

Follow-Up Analysis

Validation Rule Analysis

Run validation rules in order to unveil anomalies and errors in the data in the database.

Run Validation

Outlier detection

Analyze potential outlier values based on standard deviations or min-max values. Outlier values can be examined and marked for follow-up.

Analyze

Follow-Up Analysis

View or edit data values marked for further follow-up during data entry or analysis.

View Data Values

Select Animal Region and run the HIV validation rules rules from January - April 2023

Validation Rule Analysis ?

Parent organisation unit

Trainingland

Animal Region

Food Region

Start Date

2023-01-01

End Date

2023-04-01

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 2023	MEDIUM	HIV tests positive <= HIV tests performed	1,199.00	<=	296.00	

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Review the validation details

There is only validation violation in Cardinal Hospital in March 2023. Select the details button of one of the violations so you can see in more detail what the issue is.

Validation Details

VALIDATIONS RESULT DETAILS

VALIDATION RULE

Name

HIV tests positive <= HIV tests performed

Description

HIV tests positive <= HIV tests performed

LEFT SIDE

DATA ELEMENT	VALUE
HIV - HIV tests positive Femmelle	300.00
HIV - HIV tests positive Mâle	899.00

RIGHT SIDE

DATA ELEMENT	VALUE
HIV - HIV tests performed Mâle	118.00
HIV - HIV tests performed Femmelle	178.00

[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 HIV tests positive should be \leq 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:

Organisation Unit

Cardinal Hospital Gateway PHC

Data Set

Immunisation

Period

January 2023

Prev year


Next year

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.

DPT-HepB-HIB 1	112	2	114
DPT-HepB-HIB 2	88		88
DPT-HepB-HIB 3	73	1	74

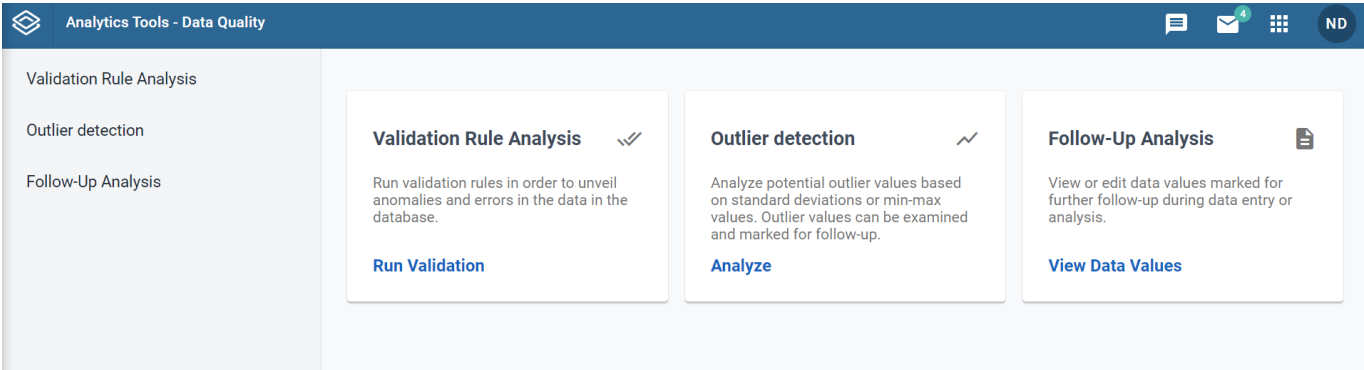
The second value is being taken from our stock section

DPT-HepB-Hib	1124							936	188
--------------	------	--	--	--	--	--	--	-----	-----

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 2023 using the "Immunisation validation rules" group.

Parent organisation unit

- ▼ Trainingland
- ▶ Animal Region
- ▼ Food Region
- ▶ Dessert District
- ▶ Dinner District
- ▶ Fruit District
- ▶ Staple District
- ▶ Sweet District
- ▶ Vegetable District

Start Date

2023-01-04

End Date

2023-04-04

Validation Rule Group

Immunisation 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
Cake Hospital Gateway PHC	February 2023	MEDIUM	DPT-HepB-Hib doses given should be less than total used	473.00	<=	466.00	
Pudding Primary Health Centre	February 2023	MEDIUM	DPT-HepB-Hib doses given should be less than total used	223.00	<=	218.00	
Brownie Dispensary	February 2023	MEDIUM	DPT-HepB-Hib doses given should be less than total used	66.00	<=	65.00	
Pie Health Centre	February 2023	MEDIUM	DPT-HepB-Hib doses given should be less than total used	226.00	<=	222.00	

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 February 2023.

Validation Details

VALIDATION RULE

Name

DPT-HepB-Hib doses given should be less than total used and wasted

Description

DPT-HepB-Hib doses given should be less than total used and wasted

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 \leq 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 based 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

Organisation Unit	<input type="text" value="Beetle Health Centre"/>		
Data Set	<input type="text" value="Immunisation"/>		
Period	<input type="text" value="January 2023"/>	<input type="button" value="Prev year"/>	<input type="button" value="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 2023
- Validation Rule Group : Immunisation thresholds
- Ensure the send notifications option is selected

Validation Rule Analysis ?

Parent organisation unit

- ▼ Trainingland
- ▼ Animal Region
- ▶ Bird District
- ▶ Cat District
- ▶ Dog District
- ▶ Fish District
- ▶ Game District
- ▶ Insect District
- ▶ Food Region

Start Date

2023-01-01

End Date

2023-03-31

Validation Rule Group

Immunisation thresholds ▼

- ☒ Send Notifications
- ☐ Persist new results

Validate

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

← Validation Rule Analysis ?

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Organisation Unit	Period	Importance	Validation Rule	Value	Operator	Value	Details
Beagle Hospital Gateway PHC	January 2023	MEDIUM	The amount of DPT-HepB-Hib 2 administered should be <= the	2,007.00	<=	1,964.00	
Beagle Hospital Gateway PHC	January 2023	MEDIUM	The amount of rotavirus 2 administered should be <= the	6,757.00	<=	700.00	
Beetle Health Centre	January 2023	MEDIUM	The amount of rotavirus 2 administered should be <= the	133.00	<=	127.00	
Flounder Health Centre	January 2023	MEDIUM	The amount of rotavirus 2 administered should be <= the	293.00	<=	287.00	

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).

+

COMPOSE

Inbox

Validation7

Ticket

System2

←

Validation violations as of 2023-04-04T16:40:11

Assignee

-

Participants

Nick Dutta

Nick Dutta

Ebrahim Al-Ariqi

me

Nick Dutta

Nick Dutta

Nick Dutta

Aanyo AHIAGNO

Pamod Amarakoon

Nick Dutta

Olav Poppe

Kirti Thakur

Add participants to conversation

+ ADD

Message from system

a minute ago, 12:40

Violations: High 0, medium 7, low 0

Rotavirus 2 doses given exceeds calculated threshold
The number of Rotavirus 2 doses 6757.0 should be <= the Rotavirus 2 threshold 700.0 in Beagle Hospital Gateway PHC during 202301. Please follow up on this value.

Rotavirus 2 doses given exceeds calculated threshold
The number of Rotavirus 2 doses 133.0 should be <= the Rotavirus 2 threshold 127.0 in Beetle Health Centre during 202301. Please follow up on this value.

Rotavirus 2 doses given exceeds calculated threshold
The number of Rotavirus 2 doses 293.0 should be <= the Rotavirus 2 threshold 287.0 in Flounder Health Centre during 202301. Please follow up on this value.

Rotavirus 2 doses given exceeds calculated threshold
The number of Rotavirus 2 doses 26.0 should be <= the Rotavirus 2 threshold 21.0 in Buffalo Private medical practice during 202303. Please follow up on this value.

Auto refresh
(05:00)

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

14 / 14