DHIS2 Data Quality Validation Rules and Notifications

DQ Academy, Day 4 – Oct 22

Part 1 – Building validation rules

Objectives – Bring DQ to the user

1. Understand the **logic** behind validation rules

2. Know how to **build** validation rules

Our email is everything.

Main Principle

- Send data quality issues to the user.

  - Data use is low because data trust is low.

  - Data trust is low because people can not see the DQ issues.

    - Data quality issues are a feature of the system not a failure.

    - The failure is not being able to do something about it.

    - Make it so everyone can see the DQ issues.

  - Send DQ alerts to where people spent their time:

    - Email

    - SMS

    - Whatsapp

  - In the alerts tell them what they need to do based upon defined SoPs

    - Don't make people guess or figure it out on their own.

Understanding the Logic of Validation Rules

- A way to assess the quality of Data that have been entered in DHIS2

- Based on a set of **predefined rules** set for the data

- This does **NOT** allow you to **FULLY assess** whether or not reported numbers are completely accurate
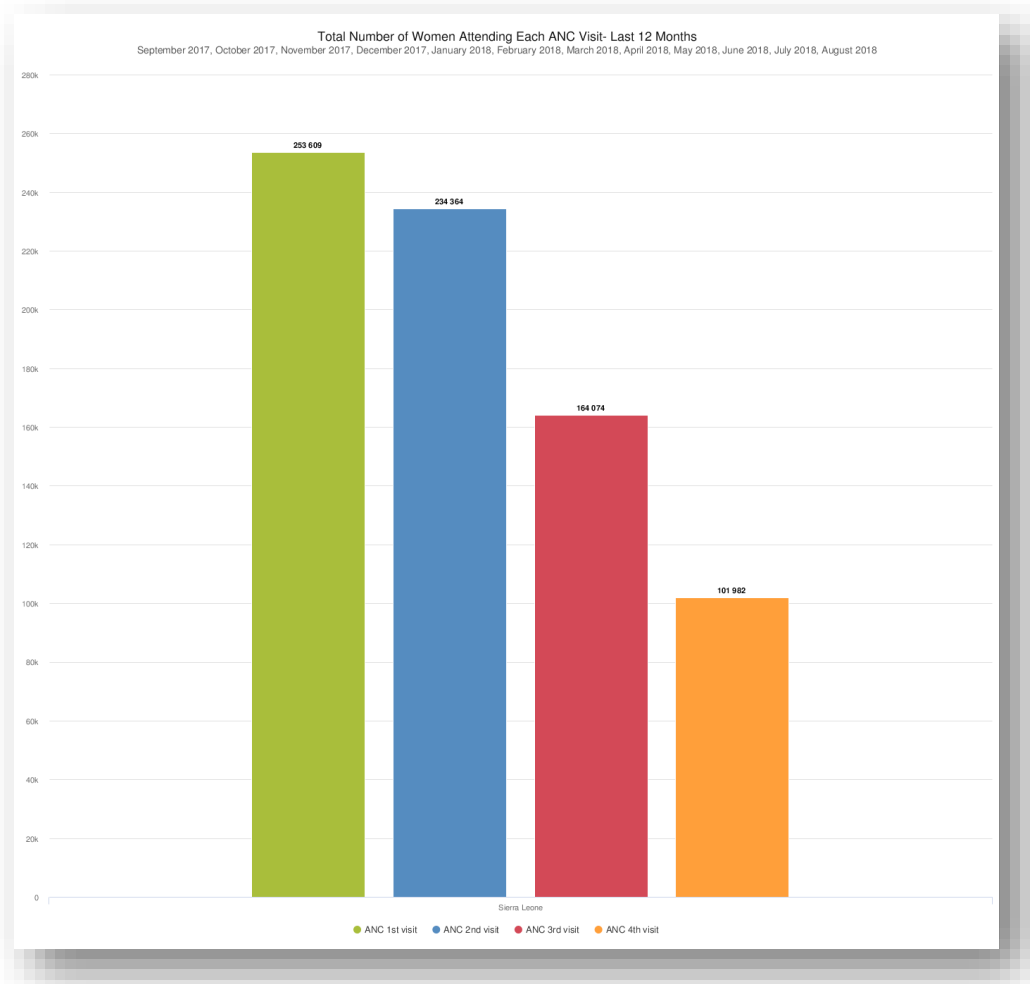
Validation Rules

- An expression that defines a relationship between a number of data elements
- Expression has Left side, right side and an operator
- Common operators are: less than, equal to or greater than
- You create **Validation Rules** based on what you know to be true
  e.g.

'Malaria RDT positive' should always be LESS THAN **'Malaria RDT tested'**

When to use validation rules:

- During aggregate data entry
  - Will be triggered during data entry
  - Can be used to block data entry if not passed
    - Only use for well trained users
- Can be run manually at any time in the data quality application
  - Can be done before supervision visits or planning meetings
  - Can trigger email or SMS alerts if validation rule notifications have been configured.
- Scheduled to run automatically
  - Any validation rule can be scheduled to run at any point.
  - Can trigger email or SMS alerts if validation rule notifications have been configured.

Let's make an example of a validation rule

- What are some possible validation rules?

Let's make ANC4 <= ANC1

Building Validation Rule: Steps

1. Make the validation rule

2. Assign it to a validation rule group

3. Test the validation rule

4. Make a validation notification

5. (Optional) schedule the validation rule group to run automatically

6. Write protocol and guidlines on how to use validation rule group

Make a validation rule

- https://academy.demos.dhis2.org/dqapp-config/

Building Validation Rule

dhis2

Name (*)

ANC 1 great than ANC 4 - Scott

Short name

Code

Description

ANC 4 should not be greater than ANC 1

Instruction

ANC4 should not be greater than ANC1. Please check these two values and correct.

Importance (*)

Medium

Period type (*)

Monthly

1. Add a name:

ANC 4 <= ANC 1 – YOUR NAME

2. Add description:

ANC 4 should not be greater than ANC 3

3. Add instructions:

ANC 4 should not be greater than ANC 1 Please check these two values and correct.

4. Importance:

Medium (High for things you know to be wrong or disease outbreak)

5. Period type:

Monthly (Should be at least the same as the frequency of data capture)

Left Side – ANC 1

Left side expr

Missing value strategy
Never skip

☐ Sliding window

Description
ANC 1 visits

#{RvArfQFKdXe}

( ) * / + - Days

DATA ELEMENTS | **PROGRAMS**

Search by name

Albendazole 1 dose at ANC
ANC 1 coverage (DHS 2014)
ANC 1 Outlier Threshold
ANC 1 visits
ANC 4 visits
ANC 5 or more visits
ANC HIV test new negative
ANC HIV test new positive
ANC HIV test previous negative
ANC HIV test previous positive
ANC no SP
ANC syphilis test negative

ANC 1 visits

Valid

Choose Missing value strategy

Left Side – ANC 1

1. Write 'ANC 1 visits' for the description
2. Search 'ANC 1'
3. Add ANC 1 visits
4. Check if equation is valid
5. Save

Choose Operator

dhis2

Instruction

ANC4 should not be greater than ANC1. Please check these two values and correct.

Equal to

Not equal to

Greater than

Greater than or equal to

Less than

Less than or equal to

Compulsory pair

Exclusive pair

Right side expr | ANC 4 visits

1. Select 'Greater than or equal to'

Right Side – ANC 4

1. Write 'ANC 4 visits' for the description

2. Search ANC 4 visits

3. Add ANC 4 visits

4. Equation is valid

5. Save

Save the validation rule

- Org. Unit levels – Sets the level that the validation rule will run for. Nothing selected means that it will run for the org unit level for which the data was captured.
- Skip this rule during form validation will not notify the user during data capture if the rule is triggered
- Save

Creating Validation Rules & Group

- Once you have **created** a set of validation rules, you need to put them in groups e.g. malaria for ease of analysis

- This group is what you will select in your **Validation Rule Analysis**

- The output will test **every rule in the Group** and show you EVERY TIME a rule was violated within your specified time and place!

Making the validation rule group: ANC – YOUR NAME

Data Quality/Validation and Validation rules Notifications

Part 2 – Running and scheduling validation rules

Learning Objectives

1. Be able to set up **validation rules notifications**

2. Be able to **run validation rule analysis**

3. Be able to **schedule** validation rules to run automatically

Make validation rule notification

Make validation rule notification

Running Validation Rule Analysis: Finding WHERE to do this

Validation Rule Analysis

1. Select your organisational units

Selecting the whole country may return hundreds of alerts (and takes a while and may crash the system)

Validation Rule Analysis

2. Select your date range

Selecting a large date range may return hundreds of alerts.

Validation Rule Analysis

Validation Rule Analysis

Validation Rule Analysis

Parent organisation unit

- Sierra Leone
  - Bo
  - Bombali
  - Bonthe
  - Kailahun
  - Kambia
  - Kenema
  - Koinadugu
  - Kono
  - Moyamba
  - Port Loko
  - Pujehun
  - Tonkolili
  - Western Area

Start Date
2018-03-01

End Date
2018-09-03

Validation Rule Group
ANC

Send Notifications ☐
Persist new results ☐

VALIDATE

4. Choose if you want to send notifications

Will send notifications as defined by the validation notification

Nothing will be sent if there are not configured notifications

Validation Rule Analysis

Validation Rule Analysis ❓

Parent organisation unit

▾ ☐ Sierra Leone
  ▸ ☐ Bo
  ▸ ☐ Bombali
  ▸ ☐ Bonthe
  ▸ ☐ Kailahun
  ▸ ☐ Kambia
  ▸ ☐ Kenema
  ▸ ☐ Koinadugu
  ▸ ☐ Kono
  ▸ ☐ Moyamba
  ▸ ☐ Port Loko
  ▸ ☐ Pujehun
  ▸ ☐ Tonkolili
  ▸ ☐ Western Area

Start Date
2018-03-01

End Date
2018-09-03

Validation Rule Group
ANC

Send Notifications ☐
Persist new results ☐

VALIDATE

5. Select if you would like to presist new results

This will save the results of the validation rule analysis. Saved results can then be accessed via the API. Becomes more important when we talk about scheduling validation rules

Running Validation Rule Analysis
Finding out HOW to do this

- Start Date: April 1
- End Date: Today
- Validation Rule Group: ANC
- Organisation unit: Region A
- Click **Validate**

Demo

- https://academy.demos.dhis2.org/dqapp-config/

Running Validation Rule Analysis
Seeing the results

When to run validation rules:

- Validation rules can run automatically or manually during data entry

When to run validation rules:

- Validation rules to prevent data completion

- This can cause confusion, frustration, and hurt reporting completeness

When to do this:

- Validation rules are well formed, tested, and verified

- For well trained district or higher officers

Not for community health workers or poorly trained staff.

Name (*)
Reproductive Health

Short name
Reproductive Health

Code
DS_359593

Description

Expiry days
0

Open future periods for data entry
0

Days after period to qualify for timely submission
10

Period type (*)
Monthly

DATA INPUT PERIODS

Category combination (*)
None

Complete notification recipients

☐ Send notification to completing user

Data approval workflow

☐ Enable for Java mobile client

☐ All fields for data elements required

☑ Complete allowed only if validation passes
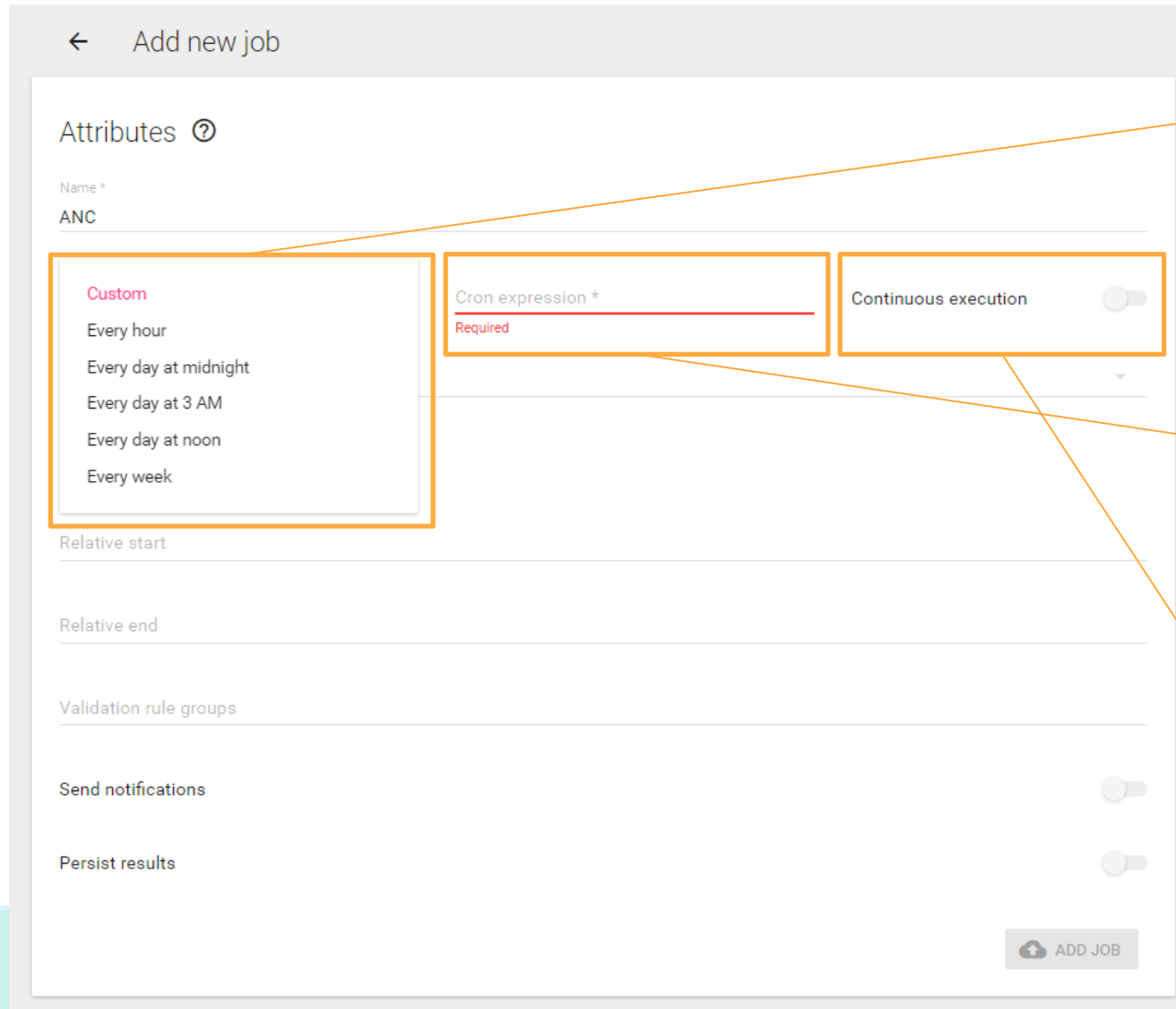
☐ Missing value requires comment on complete

When to run validation rules: Automatically scheduled

- ## Use Scheduling app to make a new 'monitoring job'
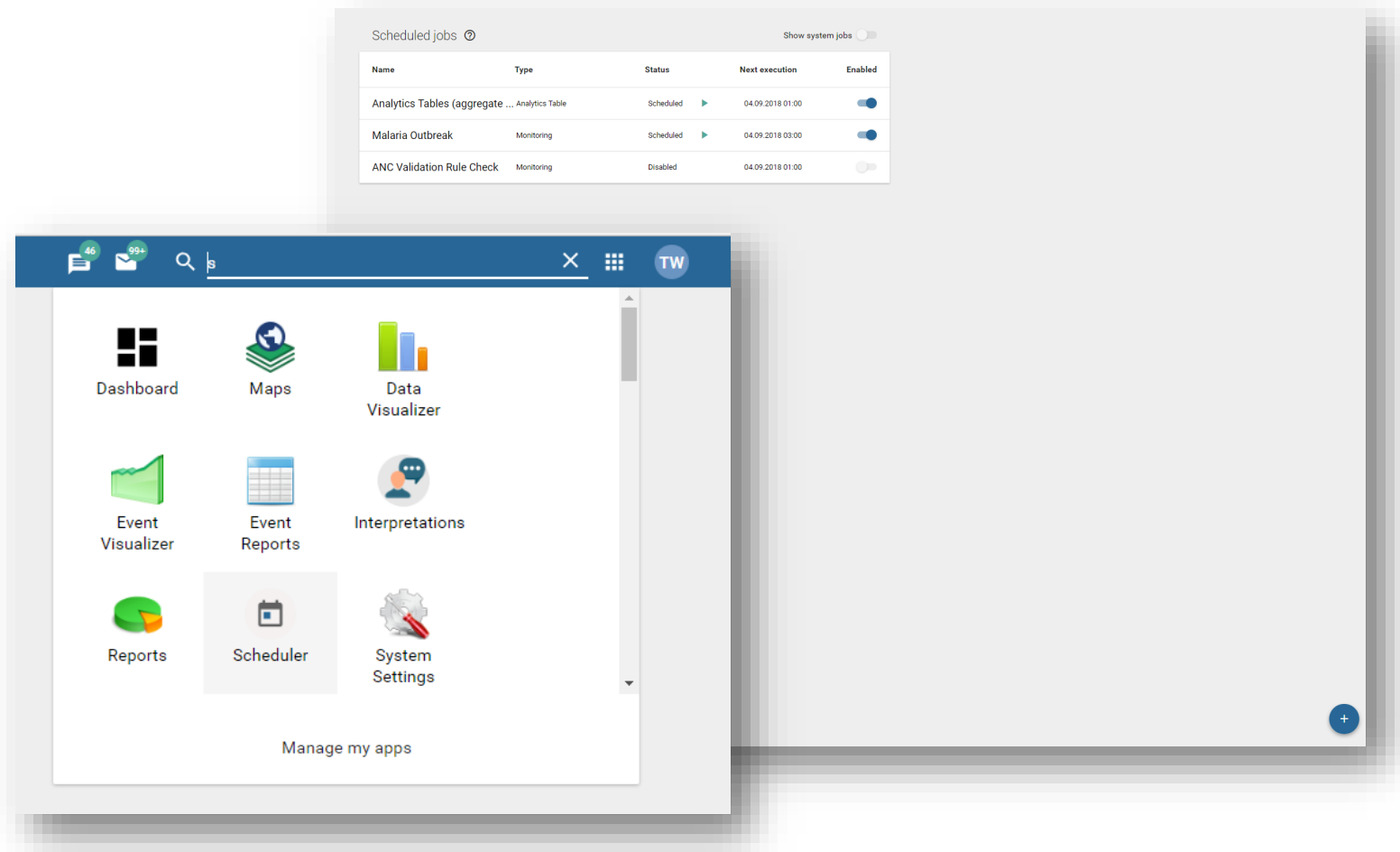
When to run validation rules: Automatically scheduled

Choose a premade frequency
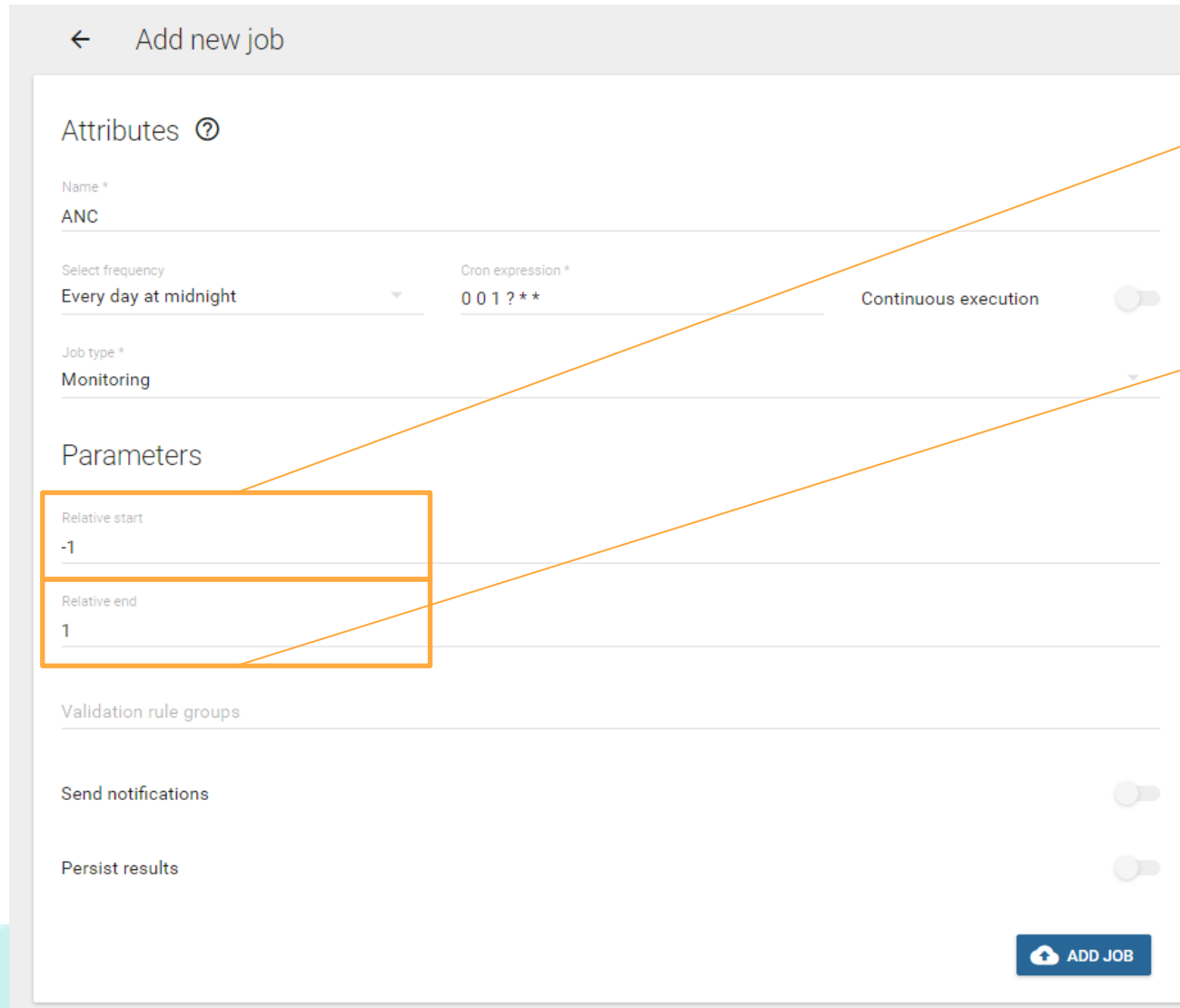
OR

Write a custom cron expression

OR

Continuous expression – will constantly be running. Good if using for disease surviallance. Bad for many validation rules over long period

When to run validation rules: Automatically scheduled

The number of days in the past to run the validation rules for

The number of days in the future to run the validation rules for

-1 was yesterday and +1 is tomorrow; therefor, any data entered for any period that covers yesterday through tomorrow.

- 3 days
- 1 month, quarter, year, etc.

When to run validation rules: Automatically scheduled

-90 days is: March 24th

+1 day is: tomorrow

Between March 24th and tomorrow there is

- 91 days
- 4 months (including March.)
- 2 quarters
- 1 year

When to run validation rules: Automatically scheduled

Choose validation rule groups by typing and selecting

More than one can be selected

When to run validation rules: Automatically scheduled

Will automatically send

notifications via email and sms if:

- notifications are configured
- email server is configured
- sms gateway is configured
- user is configured to recieve emails and sms

When to run validation rules: Automatically scheduled

Will 'persist' or save results, so that only new validation alerts are produced if they are detected.

No one wants to recieve the same validation rule alerts everyday.

Warning: could take up a lot of server space if you are persisting a lot of validation rules.

Scheduling predictor

1. Name

2. Select frequency: Every week

3. Job type: Predictor

4. Relative start: -60

5. Relative end: - 1

Attributes ⑦

Name *

ANC Outlier Threshold

Select frequency

Every week ▼

Cron expression *

0 0 3 ? * MON

Continuous execution ◯

Job type *

Predictor ▼

Parameters

Relative start

-60

Relative end

1

Predictors

ANC 1 Outlier Threshold ✕

Predictor groups

☁ ADD JOB

When to run validation rules: Automatically scheduled

Some best practice:

1. Schedule predictors to run before analytics tables

2. Schedule analytics tables before validation rules

3. Schedule just a few critical validations to run nighly or more frequently – disease surveillance and persist results

4. Schedule more, routine DQ checks to run weekly, monthly, or less frequently and make the relative period short: Start relative period =   -20 and End relative period = 1

Scheduling Running
1.   Predictors – 23:00 SUNDAY
2.   Analytics tables – 24:00 SUNDAY
3.   Validation Rules Alerts – 03:00 Daily

About Email – Get the information from your email host.

Host name
email-smtp.eu-west-1.amazonaws.com

Port
587

Username
AKIAIZ5AAPB2CSW7BQ5A

Password

☑ TLS

Email sender
no-reply@dhis2.org

SEND ME A TEST EMAIL

41.5 Email settings

Email settings

Setting	Description
Host name	Sets the host name of the SMTP server.
	When you use Google SMTP services, the host name should be *smtp.gmail.com*.
Port	Sets the port to connect to the SMTP server.
User name	The user name of the user account with the SMTP server.
	mail@dhis2.org
Password	The password of the user account with the SMTP server.
TLS	Select this option if the SMPT server requires TLS for connections.
Email sender	The email address to use as sender when sending out emails.
Send me a test email	Sends a test email to the current user logged into DHIS2.

Automatic email alerts

☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 89	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Bandajuma MCHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1 Respond to this message			03:26
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Bumpetoke CHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1 Respond to this message			02:39
☐ ⊃ 🗑 DHIS2 Community sum.	[DHIS2 Community] Summary - A brief summary since your last visit on June 21 DHIS2 Community Since your last visit 1 1 1 New Topics Unread Notifications Likes Received Popular Topics Support September 2 Would like to learn DHIS2			02:38
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Banka Makuloh MCHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1 Respond to this message			02:24
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Gandorhun (Gbane) CHC has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1 Respond to this message			02:23
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Massayeima MCHP has produced alerts for ANC 2 <= ANC 1 for 201808. ANC 2 cannot be higher than ANC 1 Respond to this message			02:20
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Fobu MCHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1 Respond to this message			02:18
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Bomu Saamba CHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1 Respond to this message			02:17
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Bai Largo MCHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1 Respond to this message			02:15
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Baiima CHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1 Respond to this message			02:14
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Falaba MCHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1 Respond to this message			02:12
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Baiama CHP ha			02:11
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Lakka/Ogoo Fa			02:10
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Panderu MCHP			02:10
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Bangambaya M			02:08
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Bandajuma Sinr			02:06
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Kpayama 2 MCH			02:04
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Baoma (Koya) C			02:04
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Bongor MCHP h			02:02
☐ ⊃ 🗑 DHIS 2 Demo - Sierr. 100	[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found - Bambara MCHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1 Respond to this message			02:01

Daily validation rule alert emails for ANC for whole country
2 validation rules makes:
- 19 emails
- Approximatly 2000 alerts.

USEFUL??

Automatic email alerts

[DHIS 2 Demo - Sierra Leone] ANC Validation Alerts Found

DHIS 2 Demo - Sierra Leone Message [No reply] no-reply@dhis2.org via amazonses.com
til

Bandajuma MCHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1

Respond to this message

DHIS 2 Demo - Sierra Leone Message [No reply] no-reply@dhis2.org via amazonses.com
til

Bandasuma Fiama MCHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1

Respond to this message

DHIS 2 Demo - Sierra Leone Message [No reply] no-reply@dhis2.org via amazonses.com
til

Borma (YKK) MCHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1

Respond to this message

DHIS 2 Demo - Sierra Leone Message [No reply] no-reply@dhis2.org via amazonses.com
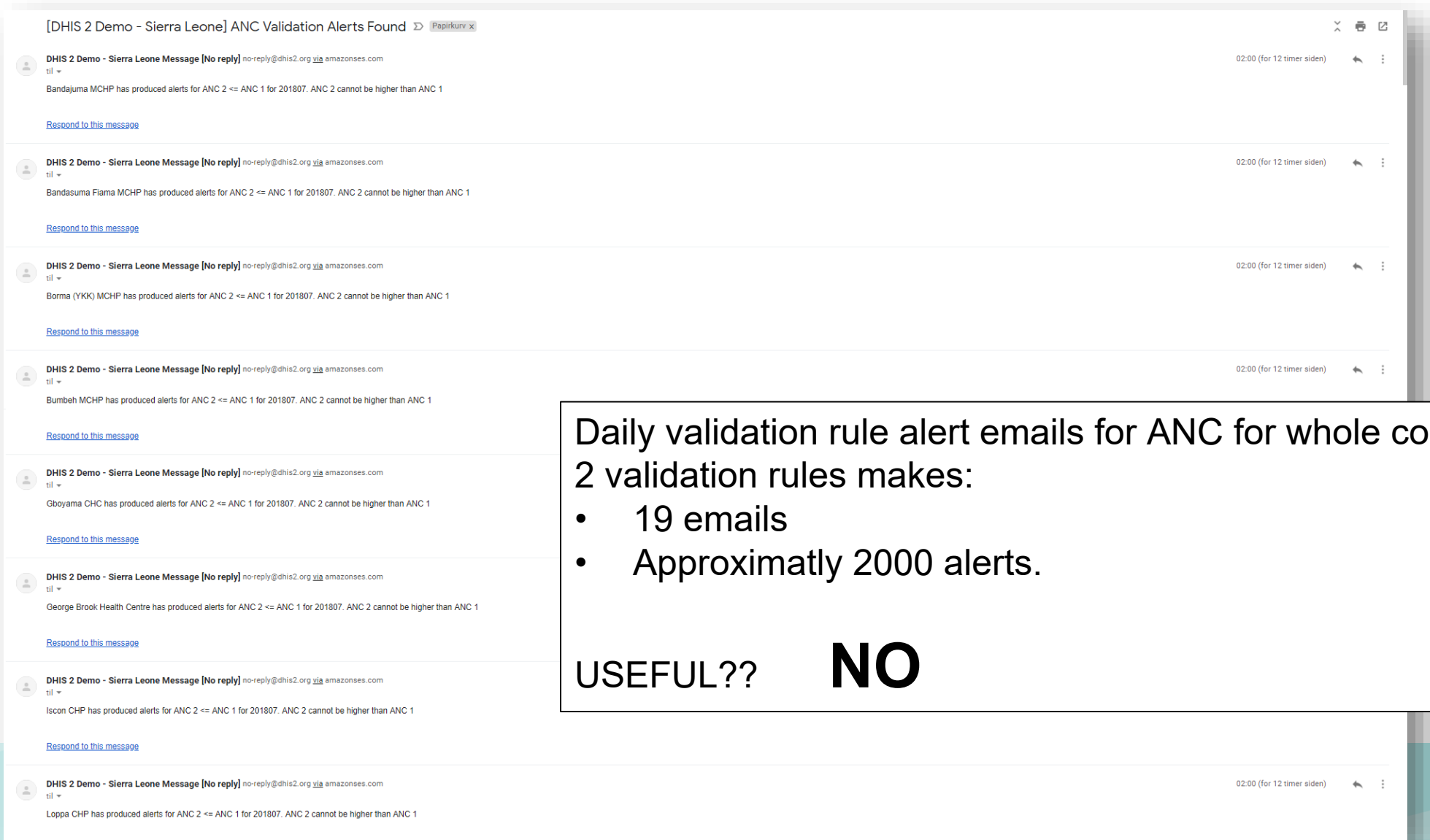til

Bumbeh MCHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1

Respond to this message

DHIS 2 Demo - Sierra Leone Message [No reply] no-reply@dhis2.org via amazonses.com
til

Gboyama CHC has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1

Respond to this message

DHIS 2 Demo - Sierra Leone Message [No reply] no-reply@dhis2.org via amazonses.com
til

George Brook Health Centre has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1

Respond to this message

DHIS 2 Demo - Sierra Leone Message [No reply] no-reply@dhis2.org via amazonses.com
til

Iscon CHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1

Respond to this message

DHIS 2 Demo - Sierra Leone Message [No reply] no-reply@dhis2.org via amazonses.com
til

Loppa CHP has produced alerts for ANC 2 <= ANC 1 for 201807. ANC 2 cannot be higher than ANC 1

Daily validation rule alert emails for ANC for whole country
2 validation rules makes:
- 19 emails
- Approximatly 2000 alerts.

USEFUL??   **NO**

How and for whom can automatic validation email alerts be useful?

Example from Rwanda outlier detection to district officers on monthly basis →

From: "Rwanda HMIS Message [No reply]" <trainmutali@gmail.com>
Date: June 6, 2019 at 10:00:00 PM PDT
To: Undisclosed recipients: ;
Subject: [Rwanda HMIS] Validation violations as of 2019-06-07T07:00:00

Violations: High 23, medium 0, low 0

A violation of the Penta 3 outlier data validation rule was detected at Batsinda HP for 201905 on 20
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Bumbogo (ex-Gikomero I) CS f
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Cyuga HP for 201905 on 2019-
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Cyumba CS for 201905 on 2019
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Gatsata CS for 201905 on 201
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Gikore CS for 201905 on 2019
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Gitarama CS for 201905 on 20
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Gitwe CS for 201905 on 2019-
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Harmony Clin for 201905 on 2
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Jenda (nyabihu) HP for 20190
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Kirambi CS for 201905 on 201
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Kirarambogo CS for 201905 on
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Ntoma CS for 201905 on 2019-
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Nyarugunga CS for 201905 on
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Rubengera CS for 201905 on 2
Please confirm that the value is correct of Penta 3

A violation of the Penta 3 outlier data validation rule was detected at Ruheru CS for 201905 on 2019
Please confirm that the value is correct of Penta 3

How and for whom can automatic validation email alerts be useful?

Example from Cameroon on disease surveillance on a daily basis to national IDSR team →

[Ministère de la Santé Publique / Ministry of Public Health - Cameroon] Validation violations as of 2020-06-16T07:00:00

Inbox ×

Ministère de la Santé Publique / Ministry of Public Health - Cameroon message [No reply] <dhisminsantecmr@gmail.com>
to ▾

Tue, Jun 16, 9:0

🗛 French ▾ > English ▾   Translate message

Violations: High 0, medium 1, low 4

Attention ! seuil d'alerte dépassé, Epidémie suspecte de Paralysie Plasque Aïgue (PFA).
La FOSA HD Gazawa a enregistré 2.0 cas de Paralysie Plasque Aïgue (PFA) pour la période 2020W13.
Bien vouloir vérifier.

Source : DHIS2, Cameroun (www.dhis-minsante-cm.org)

Attention ! seuil d'alerte dépassé, Epidémie suspecte de Paralysie Plasque Aïgue (PFA).
La FOSA HD Gazawa a enregistré 1.0 cas de Paralysie Plasque Aïgue (PFA) pour la période 2020W15.
Bien vouloir vérifier.

Source : DHIS2, Cameroun (www.dhis-minsante-cm.org)

Attention ! seuil d'alerte dépassé, Epidémie suspecte de Paralysie Plasque Aïgue (PFA).
La FOSA CSI Gazawa a enregistré 1.0 cas de Paralysie Plasque Aïgue (PFA) pour la période 2020W7.
Bien vouloir vérifier.

Source : DHIS2, Cameroun (www.dhis-minsante-cm.org)

Attention ! seuil d'alerte dépassé, Epidémie suspecte de Paralysie Plasque Aïgue (PFA).
La FOSA HD Gazawa a enregistré 2.0 cas de Paralysie Plasque Aïgue (PFA) pour la période 2020W7.
Bien vouloir vérifier.

Source : DHIS2, Cameroun (www.dhis-minsante-cm.org)

Attention ! seuil d'alerte dépassé, Epidémie suspecte de Rougeole.
La FOSA CSI Gazawa a enregistré 5.0 cas de Rougeole pour la période 2020W12.
Bien vouloir vérifier.

Source : DHIS2, Cameroun (www.dhis-minsante-cm.org)

Data Quality SoPs

- Defines what actions to take by everyone.

  – What is the process for each person

  – What automated messages does each person receive

    - User groups for messages

    - Org unit contact details are updated