Measles and Rubella Risk Assessment Tool

User Guide

PAHO
Pan American Health Organization
World Health Organization
Regional Office for the Americas

Measles and Rubella Risk Assessment Tool

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Washington, D.C., 2022

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The adaptation of the Measles and Rubella Risk Assessment Tool to the Region of the Americas was based on the vast experience of the countries during the process of sustaining the hard-won elimination gains for both diseases. To this end, the Pan American Health Organization/World Health Organization (PAHO/WHO) would like to acknowledge everyone who participated during the different technical meetings where the tool and its user guide were piloted and adjusted to their final version.

This publication was prepared by the Immunization Unit of the Family, Health Promotion and Life Course Department, PAHO/WHO, under the technical coordination of Pamela Bravo-Alcántara, Desirée Pastor, and Claudia Ortiz.

INTRODUCTION

This user guide is yours to keep and serves as instructional material and a continuing resource for the concepts learned. This guide describes how to use the Risk Assessment Tool for measles and rubella, breaking the process into several steps to foster user-friendliness. Test data from Belize were used in this document, to illustrate each of the steps of tool functioning. The guide also includes a section on the most common dilemma issues and troubleshooting (Annex 1).

The Risk Assessment Tool

The Pan American Health Organization Risk Assessment Tool identifies areas not meeting measles and rubella programmatic targets for the implementation of corrective actions, to strengthen the sustainability of measles and rubella elimination in the Region of the Americas. Specifically, the use of the tool aims to:

1. Assess the risk for measles and rubella virus dissemination following an importation;
2. Identify at-risk municipalities to prioritize the implementation of corrective measures in immunization and surveillance areas;
3. Validate surveillance and immunization data collected routinely; and
4. Strengthen local capacities in the use and analysis of surveillance and immunization data.

There are two versions of the PAHO Risk Assessment Tool, for outbreak and non-outbreak scenarios. This tool is part of PAHO's efforts to build technical operational capacity within its Member States to maintain the hard-won elimination gains in their territories. The tool was built in Excel, and soon will be on a web-based version.

Note: The outbreak version of the tool should be used when confirmed cases of measles or rubella were notified during the year of reporting the surveillance data.

Risk Categories, Indicators, and Scoring

Overall, risk was assessed as the sum of indicator scores that fall into five main categories: population immunity; surveillance quality; program delivery performance; threat probability assessment; and rapid response. The scoring for each indicator was based on expert consensus.

The tool assigns each municipality a risk of either low, medium, high, or very high based on the risk score. All risk assessment categories are scored and combined to assign an overall risk score for each municipality, with a range of possible scores from 0 to 100.

To establish cut-off criteria for risk categories, a distribution was constructed consisting of all possible combinations of scores from each indicator. Risk categories are defined by the 25th, 50th, and 75th percentiles of this distribution. Using fixed cut-off points based on the distribution allows for standardization of risk assignments, as shown in Table 1.

Table 1. Risk scoring assigned at the municipality level

Color	Risk categories	Total risk points
	Low risk	≤25
	Medium risk	>25 and ≤50
	High risk	>50 and ≤75
	Very high risk	>75

Annexes 2 and 3 present the complete risk matrix of categories, indicators, scoring, and formulas for the outbreak and non-outbreak scenarios. The category of population immunity received the greatest proportion of total possible risk points (40%), followed by case-based surveillance quality (20%), program delivery performance (16%), threat probability assessment (12%), and rapid response to imported cases (12%). Currently, the tool cannot be modified to accommodate countries' specific indicators or requests.

Results can be shown by maps with municipalities color-coded by risk category. In addition, the risk scores of municipalities can be displayed by category, allowing for easy interpretation of results and better understanding of what programmatic weaknesses are driving the risk. Finally, the tool automatically generates a report displaying the main variables for each of the five categories through maps and tables.

Use of the Tool

The tool is intended to be used every year, if possible, by managers of both immunization and surveillance programs, to monitor country efforts in sustaining the elimination of measles and rubella. The results of the risk assessment tool should be used to (but not limited to):

1. Advocate with policymakers to continue investing in activities to sustain the elimination gains;
2. Mobilize resources for implementing corrective actions;
3. Prioritize local interventions based on risk score; and
4. Incorporate them in the annual country sustainability plans for measles and rubella.

The Risk Assessment Tool is not meant to be used for predicting outbreaks, but rather for preventing virus spread if an importation occurs. Additionally, the results can be used for planning and implementing measles and rubella follow-up campaigns.

Tool Sections

The tool is a Microsoft Excel workbook with 16 sheets; all of them are explained in detail throughout this user guide according to the order they appear in the tool, except for the following:

- Label Ref, which contains all the labels used by the tool in the four languages;
- Tech Data, which contains the individual risk scoring and class break for risk assessment for indicators and categories; and

- List Values, which contains the list of predefined values used by the case-based data, in the four languages.

Do not attempt to modify or edit the above-mentioned Excel sheets. If you have queries, please contact PAHO at immunization@paho.org.

Tool Specifications and Requirements for Data Input

The tool was built using Microsoft Excel. The following are the minimum system requirements that the user should have to allow tool functionality:

- Microsoft Windows 7 or more recent;
- Microsoft Excel 10 (included in Office 2010) or more recent; it should be a licensed version and not a pirated software;
- 8GB RAM.

Note: The tool will not work on Mac computers (desktops or notebooks) or online Excel.

Requirements for data input

1. Readily available and routinely collected data from the immunization and surveillance programs as reported by the Ministry of Health. The threat assessment category uses non-health official sources, such as the national statistics office, to populate variables such as population density.
2. Data from the last five calendar years, preferably collected at the municipal level.
3. Data should be final as of the end of the calendar year. Inputting ongoing/unfinished data into the tool is not recommended.
4. Shapefiles at the municipal level for mapping of risk categories.
5. If data from the municipal level are missing, incomplete, or unreliable, then data from the subnational level (state, province, or equivalent level) may be used as a substitute.
6. Some countries may perform a more granular risk analysis in their large cities (e.g., Bogotá, Mexico City, or Rio de Janeiro), for which their localities (or equivalent) will replace the municipal level. Thus, data and shapefiles should be collected at this lower level.

Results of the risk assessment are strongly related to the quality of the data used to populate the tool. For instance, poor quality data for administrative vaccination coverage will produce unreliable risk assignments within a country. Therefore, it is highly recommended to review and validate internally the data prior to input into the tool.

The tool will assign the maximum risk points if data are missing. Thus, users are encouraged to populate the tool with the most complete information available. Nevertheless, if population and/or area (in square kilometers) are not entered for a municipality, then the tool will ignore this municipality, and it will be rendered in pink color in the maps (e.g., this may happen in the case of uninhabited small islands).

1 COLLECT AND PREPARE THE DATA

The tool provides a template Excel workbook so that the user can collect and prepare the data required for each category at the municipality level (Annex 4). The use of this template is recommended, because as a single source it speeds uploading the data for each category into the tool and having all the data in a single Excel file reduces errors. Using more than one Excel file to upload the data into the tool is not recommended.

This workbook is composed of the following sheets:

1. General Data
2. Population and Area
3. Population Immunity
4. Program Performance
5. Vulnerable Groups
6. Case-Based Data
7. Rapid Response

Once data collection is complete, ensure that numeric values (e.g., vaccination coverage) are in number format. Below are the instructions on how to populate the Excel workbook.

1.1 | GENERAL SHEET

You should input the values for the following variables in this sheet:

- Name of country or subnational level, depending on which administrative level is using the tool.

	A	B
1	**General Data**	
2	Name of country or subnational level	Belize
3	Year of risk assessment	2019
4	Does the country have a trained rapid response team at the national level?	Yes
5	Year of the last campaign (YYYY)?	2005
6	MMR1 age of administration (months)	12
7	MMR2 age of administration (months)	18

1-General | 2-Pop Area | 3-Population Immunity | 4-Program Performance | 5-Vulnerable Groups | 6-Case Based Data | 7-Rapid Response

1.2 | POPULATION AND AREA SHEET

Collect and store the following data in this sheet:

- Admin1 georeferencing codes (optional);
- Admin2 georeferencing codes (optional);
- Admin1: country or subnational level;
- Admin2: municipality name;
- Total population as of the previous year, or most recent data;
- Area (km^2) of municipality: area in square kilometers.

	A	B	C	D	E	F
1	**Admin1 geo codes**	**Admin2 geo codes**	**Subnational level**	**Municipality**	**Pop_2019**	**Area (km2) of municipality**
2	BLZ	BLZ.1_1	Belize	Belize	120,602	4,307.2
3	BLZ	BLZ.2_1	Belize	Cayo	96,197	5,195.6
4	BLZ	BLZ.3_1	Belize	Corozal	48,429	1,859.6
5	BLZ	BLZ.4_1	Belize	Orange Walk	51,749	4,636.1
6	BLZ	BLZ.5_1	Belize	Stann Creek	43,944	2,553.7
7	BLZ	BLZ.6_1	Belize	Toledo	37,614	4,413.3

1-General | 2-Pop Area | 3-Population Immunity | 4-Program Performance | 5-Vulnerable Groups | 6-Case Based Data | 7-Rapid Response

The tool can use the Admin1 and Admin2 georeferencing codes for matching their names between the Excel template and the shapefile. This functionality will be explained in detail in section **2.6: Manage Alternative Names for Admin1 and Admin2 Geographic Sites**. Countries can obtain the georeferencing codes from their shapefile. Including the georeferencing codes in the Excel file is optional and not mandatory, as the tool can use the geographic names to do the match.

Note: Large cities, such as Bogotá, Mexico City, or Rio de Janeiro, can be considered as Admin1 and their corresponding localities (or equivalent) as Admin2.

1.3 | POPULATION IMMUNITY SHEET

Collect and populate the following data in this sheet:

- Admin1 georeferencing codes (optional);
- Admin2 georeferencing codes (optional);
- Admin1: country or subnational level;
- Admin2: municipality name;
- MMR1 coverage by municipality for the previous five years (in whole numbers);
- MMR2 coverage by municipality for the previous five years (in whole numbers);
- Coverage of the latest follow-up campaign, if any (in whole numbers).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Admin1 geo codes	Admin2 geo codes	Subnational level	Municipality	MMR1 coverage by municipality (in whole numbers)					MMR2 coverage by municipality (in whole numbers)					Coverage of the latest follow-up campaign (in whole numbers)
2					2014	2015	2016	2017	2018	2014	2015	2016	2017	2018	
3	BLZ	BLZ.1_1	Belize	Belize	97	97	103	76	104	92	98	95	80	95	94
4	BLZ	BLZ.2_1	Belize	Cayo	94	92	88	89	92	86	90	96	89	84	93
5	BLZ	BLZ.3_1	Belize	Corozal	95	99	102	122	94	94	94	100	108	93	97
6	BLZ	BLZ.4_1	Belize	Orange Walk	96	98	110	100	98	96	98	97	96	97	88
7	BLZ	BLZ.5_1	Belize	Stann Creek	94	93	92	66	97	90	98	98	79	92	97
8	BLZ	BLZ.6_1	Belize	Toledo	96	93	82	117	94	92	97	90	84	82	88

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1.4 | PROGRAM PERFORMANCE SHEET

Collect and populate the following data in this sheet:

- Admin1 georeferencing codes (optional);
- Admin2 georeferencing codes (optional);
- Admin1: country or subnational level;
- Admin2: municipality name;
- Number of Penta1 doses for the previous year (in whole numbers);
- Number of MMR1 doses for the previous year (in whole numbers);
- Number of MMR2 doses for the previous year (in whole numbers).
- If the country administers MMR2 at 4 or 5 or 6 years of age, then in order to identify the year for which MMR1 doses data should be entered, subtract 4, 5, or 6 from the previous year.

	A	B	C	D	E	F	G	H	I
1	Admin1 geo codes	Admin2 geo codes	Subnational level	Municipality	Number of doses Penta1	Number of doses of MMR1	Number of doses of MMR2	Drop-out formula No. of doses (MMR1 – MMR2) / No. of doses MMR1	Drop-out formula No. of doses (Penta1 – MMR1) / No. of doses Penta1
2					2018	2018	2018	2018	2018
3	BLZ	BLZ.1_1	Belize	Belize	1,839	1,677	1,531	8.7	8.8
4	BLZ	BLZ.2_1	Belize	Cayo	1,636	1,683	1,556	7.5	-2.8
5	BLZ	BLZ.3_1	Belize	Corozal	717	693	688	0.7	3.3
6	BLZ	BLZ.4_1	Belize	Orange Walk	1,025	976	963	1.3	4.7
7	BLZ	BLZ.5_1	Belize	Stann Creek	979	996	940	5.6	-1.7
8	BLZ	BLZ.6_1	Belize	Toledo	597	605	541	10.5	-1.3

1-General | 2-Pop Area | 3-Population Immunity | 4-Program Performance | 5-Vulnerable Groups | 6-Case Based Data | 7-Rapid Response

Note: Drop-out rates for Penta1-MMR1 and MMR1-MMR2 are calculated automatically. Do not fill these data columns (highlighted in neutral color).

1.5 | VULNERABLE GROUPS SHEET

Collect and populate the following data in this sheet:

- Admin1 georeferencing codes (optional);
- Admin2 georeferencing codes (optional);
- Admin1: country or subnational level;
- Admin2: municipality name;
- Answer Yes or No for the following questions as of the previous year. Please note that the presence of one single condition listed in each of the questions provides a Yes answer. For example, in the following condition: "Presence of migrant population, internally displaced persons, slums, or Indigenous communities," if the municipality has Indigenous communities, then it must be marked Yes.
    1. Presence of migrant population, internally displaced persons, slums, or Indigenous communities.
    2. Presence of a large influx of tourists or ecotourism destinations.
    3. Presence of security and safety concerns that hinders routine vaccination or epidemiological field investigation (e.g., presence of drug trafficking).
    4. Presence of disasters or calamities.
    5. Limited access to health services due to terrain or transportation issues.
    6. Presence of high-traffic transportation hubs, major roads (within and across countries), or zones bordering large urban areas.
    7. Presence of border communities.
    8. Presence of areas with mass gatherings (e.g., trade/commerce, fairs, markets, sporting events, religious events, among others).

	A	B	C	D	E	F	G	H	I	J
1	Admin1 geo codes	Admin2 geo codes	Subnational level	Municipality	Presence of migrants, internally displaced persons, slums, or Indigenous communities (Yes/No)	Presence of large influx of tourists or ecotourism destinations (Yes/No)	Presence of security and safety concerns that hinders routine vaccination or epidemiological field investigation (e.g., drug trafficking) (Yes/No)	Presence of disasters or calamities (Yes/No)	Limited access to health services due to terrain/transportation issues (Yes/No)	Presence of high-traffic transportation hubs, major roads (within and across countries), or zones bordering large urban areas (Yes/No)
2					2018	2018	2018	2018	2018	2018
3	BLZ	BLZ.1_1	Belize	Belize	Yes	Yes	Yes	No	No	Yes
4	BLZ	BLZ.2_1	Belize	Cayo	Yes	Yes	Yes	No	No	Yes
5	BLZ	BLZ.3_1	Belize	Corozal	Yes	Yes	Yes	No	No	Yes
6	BLZ	BLZ.4_1	Belize	Orange Walk	Yes	Yes	Yes	No	No	Yes
7	BLZ	BLZ.5_1	Belize	Stann Creek	Yes	Yes	Yes	No	Yes	Yes
8	BLZ	BLZ.6_1	Belize	Toledo	Yes	Yes	Yes	No	Yes	Yes

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1.6 | CASE-BASED DATA SHEET

Collect and store the following data in this sheet:

- Year of the case (YYYY format).
- Admin1: country or subnational level name.
- Reporting Admin2: municipality name. Please note that suspected cases without a reporting municipality name will not be included in the risk analysis of the surveillance indicators, negatively affecting the overall risk score of this category.
- Case ID.
- Final classification. Select one of the following predefined values:
    - Discarded;
    - Measles, if it is a confirmed case;
    - Rubella, if it is a confirmed case;
    - Pending.
- Date of birth (DD/MM/YYYY format; must be a date).
- Sex. Select one of the following predefined values:
    - F (Female);
    - M (Male).
- Place of residence.
- Presence of fever – answer Yes or No to this question following the predefined values.
- Date of rash onset (must be a date).
- Documented vaccination status with measles-rubella-containing vaccine (MR) or measles-mumps-rubella containing vaccine (MMR). Select one of the following predefined values:
    - Yes;
    - No;
    - Unknown;
    - Not Eligible (individuals who are not a target of the routine national immunization schedule, such as infants under 6 months).
- Number of vaccine doses. Select one of the following predefined values:
    - 0;
    - 1;
    - 2;
    - 3;
    - More than 3;
    - Unknown.
- Date of notification (DD/MM/YYYY format; must be a date).
- Date of investigation (DD/MM/YYYY format; must be a date).
- Date of blood specimen collection (DD/MM/YYYY format; must be a date).
- Date received laboratory results (DD/MM/YYYY format; must be a date).
- Date of last vaccination (DD/MM/YYYY format; must be a date).
- Travel history. Select one of the following predefined values:
    - Yes;
    - No;
    - Unknown.

Note: The columns highlighted in yellow require predefined values. Select one value from the suggested list.

	A	B	C	D	E	F	G	H
10	*Number*	*Text*	*Text*	*Text or number*	*Predefined values*	*DD/MM/YYYY*	*Predefined values*	*Text*
11	Year (YYYY)	Departament	Municipality	Case ID	Final classification	Date of birth	Sex	Place of residence
12								
13	**Year**	**Admin1**	**Reporting municipality**	**Case ID**	**Final classification**	**Date of birth**	**Sex**	**Place of residence**
14	2018	Belize	Belize	18-057	Discarded	20/04/93	M	San Mateo,
15	2018	Belize	Cayo	18-054	Discarded	25/01/18	M	Bullet Tree Road, - San
16	2018	Belize	Belize	18-058	Discarded	25/02/96	M	Cze caulker Village,
17	2018	Belize	Belize	18-003	Discarded	24/06/16	M	6 Baracuda St., - Boca D
18	2018	Belize	Cayo	18-004	Discarded	19/06/06	F	Duck Run I, Spanish Loo
19	2018	Belize	Cayo	18-005	Discarded	4/01/09	M	Duck Run I, Spanish Loo
20	2018	Belize	Cayo	18-006	Discarded	14/07/83	F	Duck Run I, Spanish Loo
21	2018	Belize	Stann Creek	18-002	Discarded	6/01/13	M	Maya Mopan, - Stann C
22	2018	Belize	Cayo	18-007	Discarded	21/10/06	F	Duck Ruin I, Spanish Lo
23	2018	Belize	Cayo	18-008	Discarded	14/09/12	M	Duck Run I, Spanish Loo

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1.7 | RAPID RESPONSE SHEET

Collect and populate the following data in this sheet:

- Admin1 georeferencing codes (optional);
- Admin2 georeferencing codes (optional);
- Admin1: country or subnational level;
- Admin2: municipality name;
- Presence of a subnational trained rapid response team: answer Yes/No following predefined values;
- Percentage of subnational hospitals with staff trained to do triage and isolation of highly suspected and confirmed cases of measles and/or rubella (in whole numbers).

	A	B	C	D	E	F
1	**Admin1 geo codes**	**Admin2 geo codes**	**Subnational**	**Municipality**	**Presence of a trained rapid response team at the subnational level (Yes/No)**	**Percentage of subnational hospitals with trained staff to do triage and isolation for measles/rubella highly suspected cases (in whole numbers)**
2	BLZ	BLZ.1_1	Belize	Belize	Yes	50
3	BLZ	BLZ.2_1	Belize	Cayo	Yes	100
4	BLZ	BLZ.3_1	Belize	Corozal	Yes	100
5	BLZ	BLZ.4_1	Belize	Orange Walk	Yes	100
6	BLZ	BLZ.5_1	Belize	Stann Creek	Yes	50
7	BLZ	BLZ.6_1	Belize	Toledo	Yes	100

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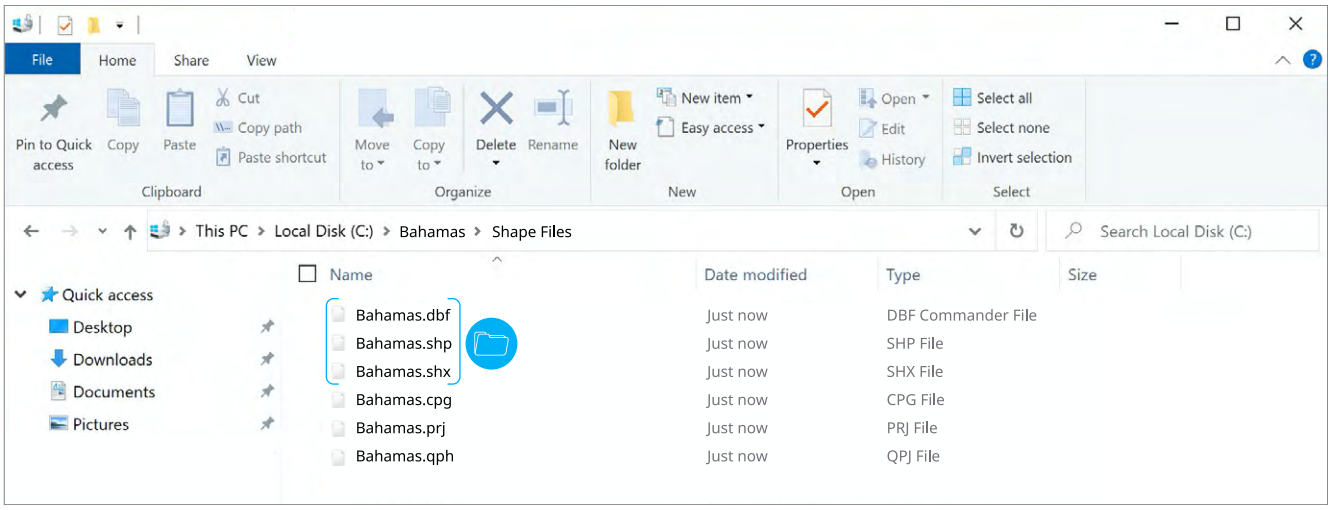
1.8 | SHAPEFILES

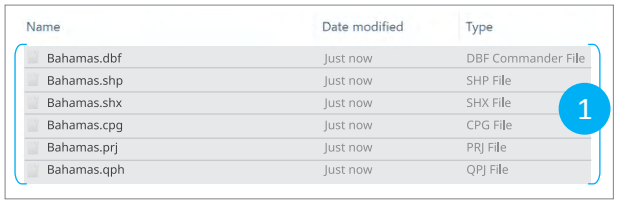
The tool requires shapefiles of the subnational, municipality, or local levels, for which the risk of measles and rubella will be shown in colored maps according to the assessed risk. For that purpose, the shapefiles should be imported into the tool. Refrain from including in the shapefiles any geographic area where data on the risk matrix of categories are not available. In addition, the total number of municipalities should be the same in the shapefile and the Excel workbook.

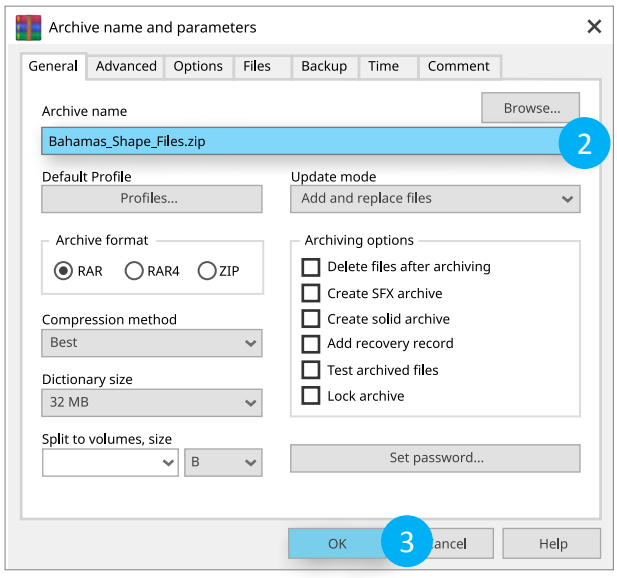
The shapefiles folder must contain at least the following files:

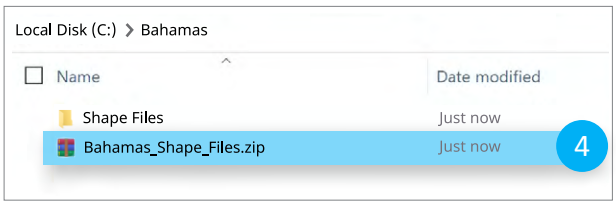
- DBF file;
- SHP file;
- SHX file



In addition, it must be compressed within a ZIP file without any subfolders. All the files must be stored in a directory of the root level of the computer (e.g., C drive).







The following step is to convert the shapefiles into GeoJSON format, for which the tool connects to an online converter service. Therefore, this setup action requires Internet access. The link below explains how to convert the shapefiles into GeoJSON using mapshaper.org, which is the recommended tool as it allows reduction of the file size (https://www.statsilk.com/maps/convert-esri-shapefile-map-geojson-format).

Note: If a GeoJSON file is already available and can be imported, then skip this step.

Section 2.3 provides the steps for uploading the shapefiles into the tool.

2 SETUP AND CONFIGURATION OF THE TOOL

Before uploading the collected data into the tool, the user will do an initial configuration by performing the following tasks:

- Set the global variables;
- Load the country flag;
- Load the shapefiles;
- Import population data;
- Import the area;
- Lock the tool.

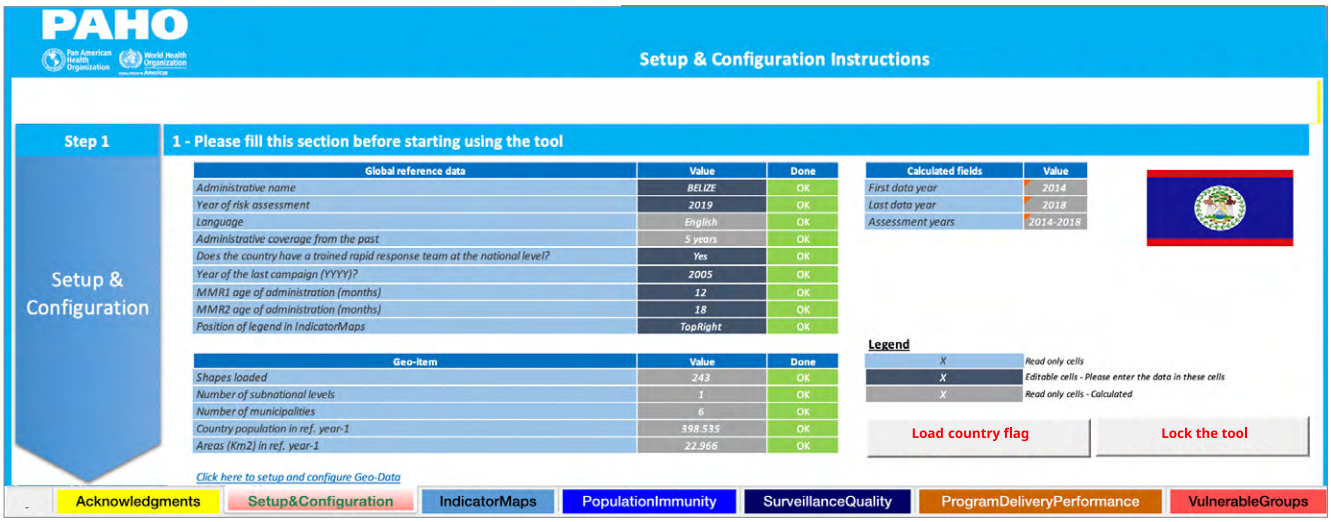
Note: The user should always save an empty version of the tool and report templates so these can be used on an annual basis. This should be done before setting up the tool.

2.1 | SET THE GLOBAL VARIABLES

To set the global variables, use the "General" sheet of the filled template.

In the "Setup & Configuration" sheet of the tool, fill the following variables:

- Administrative name: name of country or subnational level, depending on which administrative level is using the tool.
- Year of risk assessment: the year for which you want to estimate the risk. For instance, if you have data for 2017, 2018, 2019, 2020, and 2021, then you will estimate risk for 2022.
- Language: choose English, French, Portuguese, or Spanish.
- Does the country have a trained rapid response team? Choose Yes or No.
- Year of the last follow-up campaign (YYYY); if a follow-up campaign is not part of the national immunization strategy, refrain from including the year of mop-up or targeting outbreak response interventions.
- MMR1 age of administration (months): only include the number.
- MMR2 age of administration (months): only include the number.
- Position of legend in IndicatorMaps: the position of the legend in the maps; choose top left, top right, bottom left, or bottom right.



Once you enter the year of the risk assessment, the tool will automatically calculate the following values under the "Calculated fields" table, located right next to the setup and configuration panel:

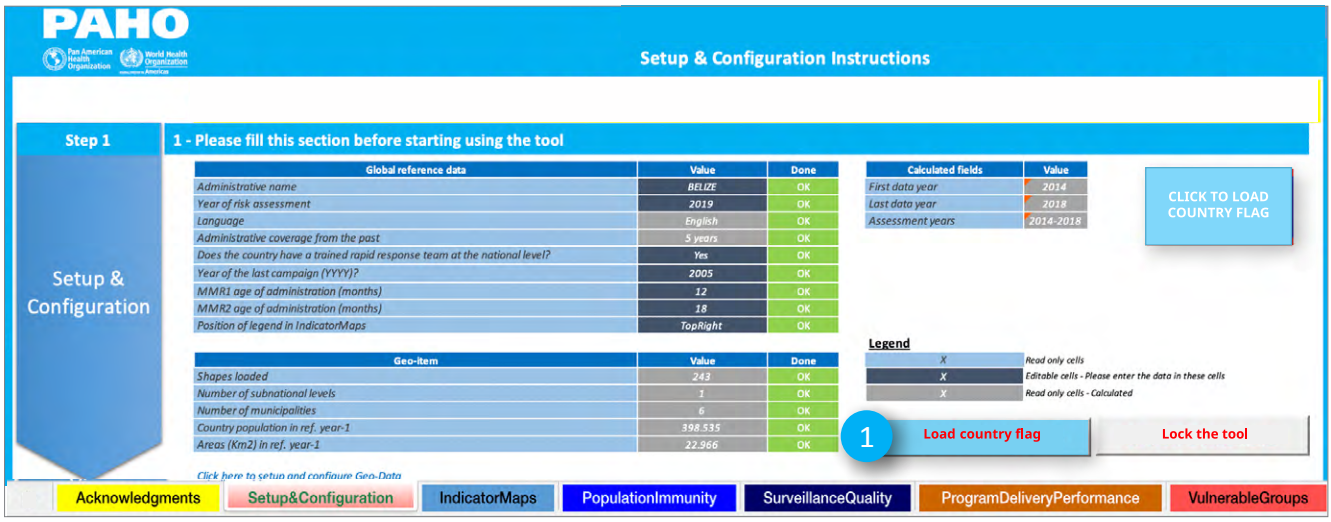
- First year of data; this year should coincide with the first year of reported administrative coverage for MMR1;
- Last year of data; this year should coincide with the last year of reported administrative coverage for MMR2;
- Assessment years; the total number of years evaluated to calculate the risk.

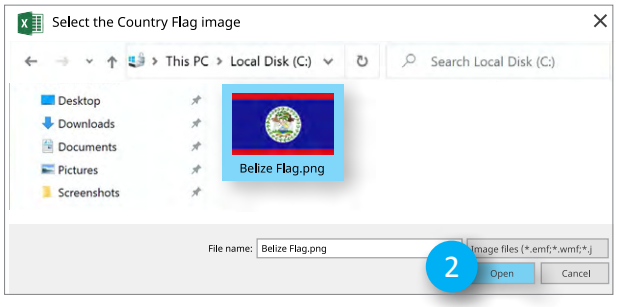
Note: Remember to **save** the Risk Assessment Tool file frequently.

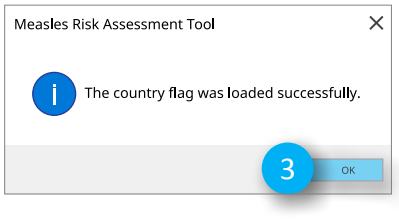
2.2 | LOAD THE COUNTRY FLAG

To load the country flag, select the "Setup & Configuration" sheet and perform the following actions:

1. Either click the "Load Country Flag" button or the flag placeholder.
2. Browse and select the country flag file and click "Open".
3. Click "OK", fill the following variables:





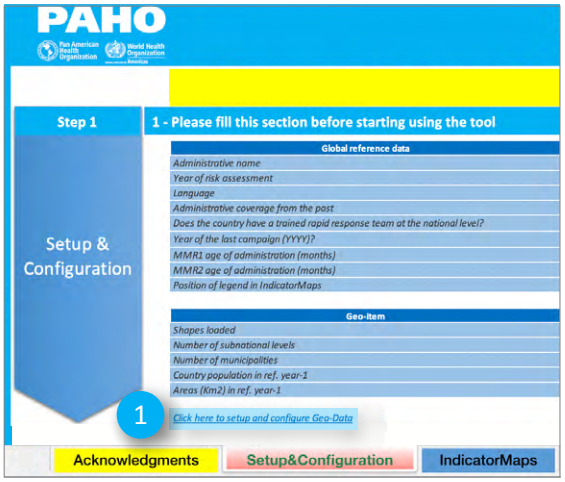


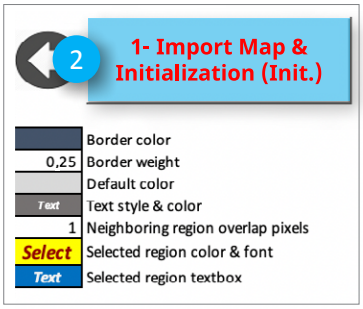
2.3 | IMPORT THE SHAPEFILES

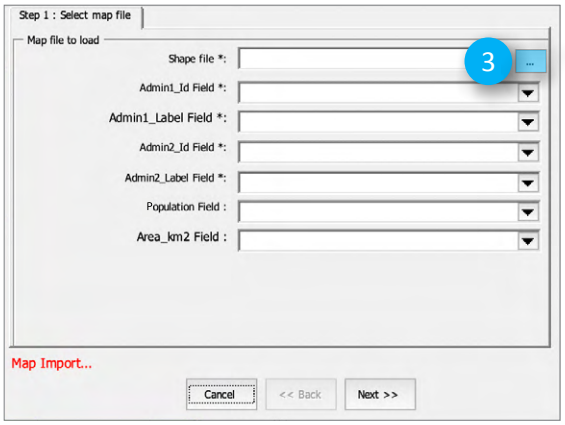
To import the shapefiles in GeoJSON format, perform the following actions:

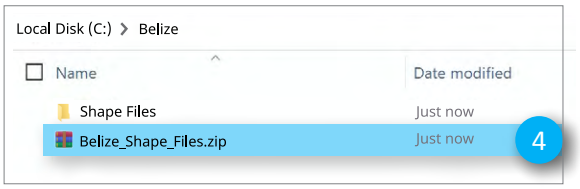
1. In the "Setup & Configuration" sheet, click the link "Click here to setup and configure Geo-Data" or navigate to the "_GeoData_Maps" sheet.
2. Click "Import Map & Initialization (Init.)" button.
3. Click the browse file button [...].
4. Select the shapefile (ZIP or GeoJSON extension) and click the "Open" button.

5. Wait a few seconds to get the shapefile converted to GeoJSON format (the shapefile name is displayed).

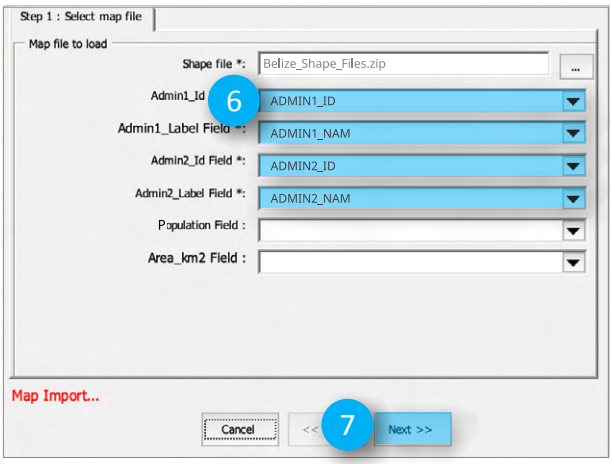




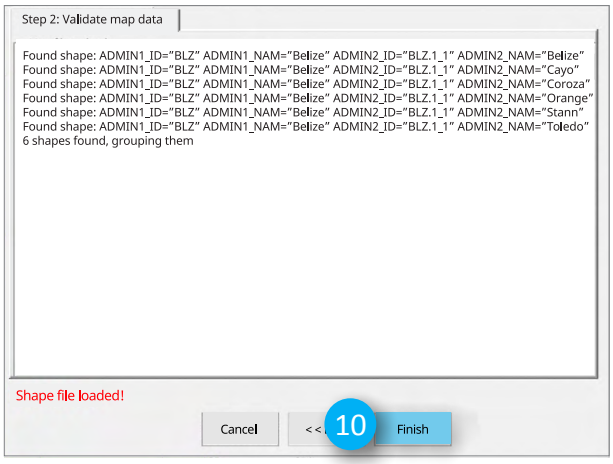




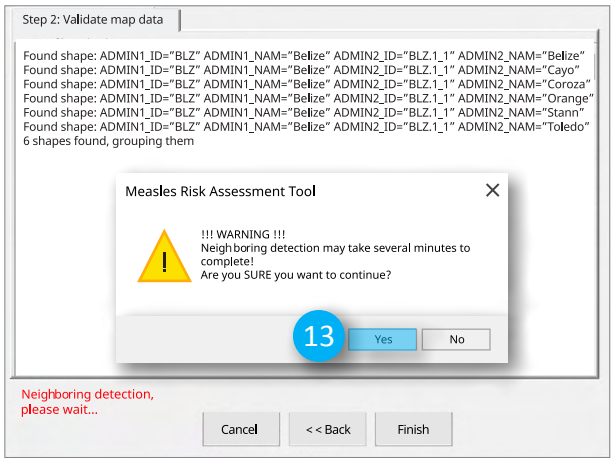
6. Map the geographic fields in the shapefile with the corresponding fields in the tool:
   - Admin1_ID Field: code of the first administrative level;
   - Admin1_Label Field: name of the first administrative level;
   - Admin2_ID Field: code of the second administrative level;
   - Admin2_Label Field: name of the second administrative level;
   - Population Field: total population if included in the shapefile. If it is not in the shapefile, it can be loaded later through the tool. Refer to step 3.4;
   - Area_km² Field: total area if included in the shapefile. If it is not in the shapefile, it can be loaded later through the tool. Refer to step 3.5.
7. Click the “Next” button.

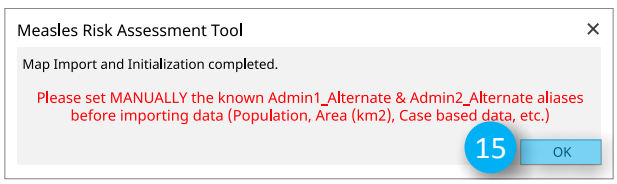


8. The shapes will be loaded into the tool as well as the selected data fields.
9. Check that the number of imported shapes (Admin2 level) coincides with the expected number of Admin2 for which the user will assess the risk.
10. Click the “Finish” button and wait for all the sheets of the tool to be populated with the imported geodata.
11. The next step is detecting all neighboring municipalities in the country, or first level of shapefile used in the tool, for which the warning message below will be displayed. Click “Yes” to continue to the neighboring municipality detection. This may take some time, depending on the number of municipalities, granularity of the shapefiles, and the Internet speed.



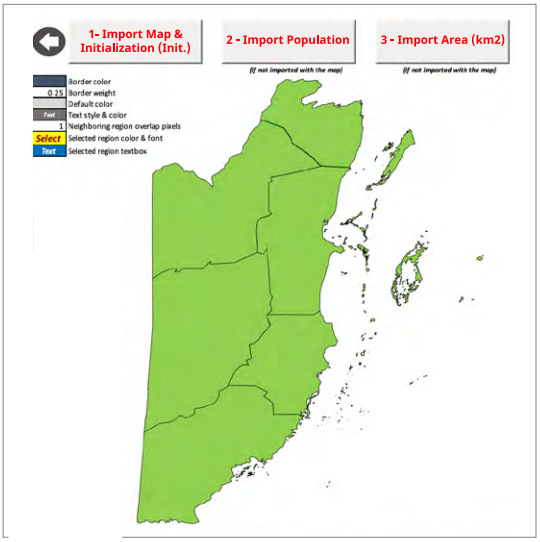
12. A message is displayed to show the number of detected neighbors for all the municipalities (Admin2 level).
13. Click the “Yes” button to continue with the next step, which will fill each sheet in the Risk Assessment Tool with the imported geodata (the subnational level and municipality names).
14. Finally, a message is displayed indicating that alternate names for Admin1 and Admin2 can be added manually into the geodata table. This step will be explained in section 2.6.
15. Click “OK” to complete the geodata import.





Note: The Simplify feature available on the www.mapshaper.org website can be used to reduce the number of map vertices and thus, the time required for neighboring municipality detection.

This is the result:

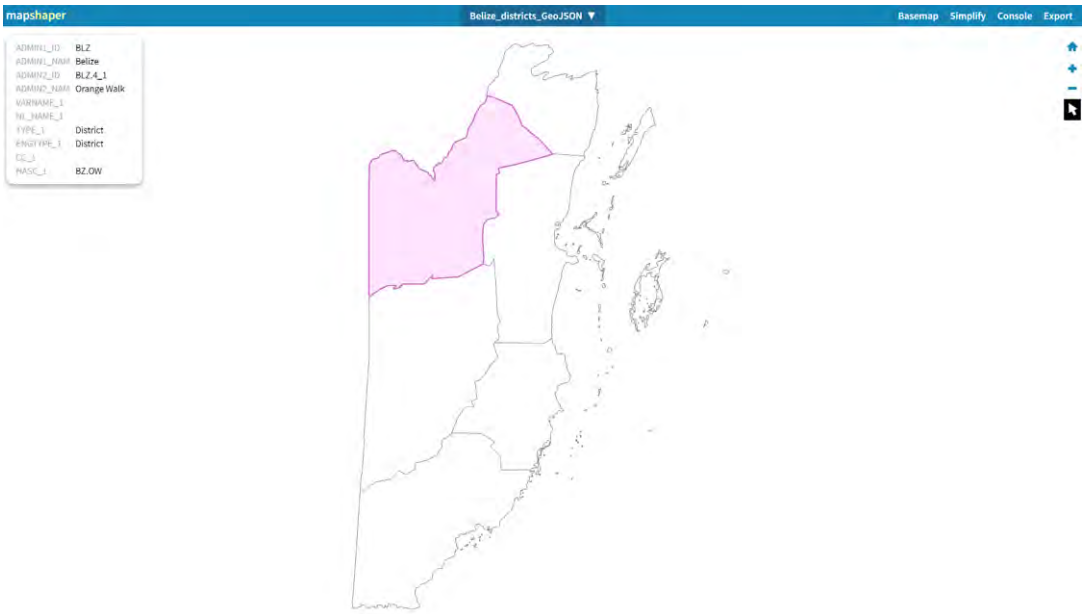


Admin1_Id	Admin1_Label	Admin1_Alternate	Admin2_Id	Admin2_Label	Admin2_Alternate	Population
BLZ	Belize		BLZ.1_1	Belize		
BLZ	Belize		BLZ.2_1	Cayo		
BLZ	Belize		BLZ.3_1	Corozal		
BLZ	Belize		BLZ.4_1	Orange Walk		
BLZ	Belize		BLZ.5_1	Stann Creek		
BLZ	Belize		BLZ.6_1	Toledo		
Total				0		0

You can use www.mapshaper.org website to identify the Admin1_ID and Admin2_ID field codes; Admin1 and Admin2 label fields by dropping the GeoJSON file in the mapshaper. Then, on the right side of the webpage, select the arrow and then click the option of inspect features. The arrow will be activated so you can select any municipality to display the information on the codes and field labels in a text box (left side of the webpage).
In the example below, you will have the following information:

- Admin1_ID corresponds to BLZ, which is the code of the first administrative level;
- Admin1_NAM corresponds to Belize, which is the name of the first administrative level;
- Admin2_ID corresponds to BLZ4.1, which is the code of the second administrative level;
- Admin 2_label corresponds to Orange Walk, which is the name of the second administrative level.

Thus, Admin1_ID, Admin1_NAM, Admin2_ID, and Admin2_label will be chosen as the geographic fields to import the GeoJSON or shapefile into the tool.

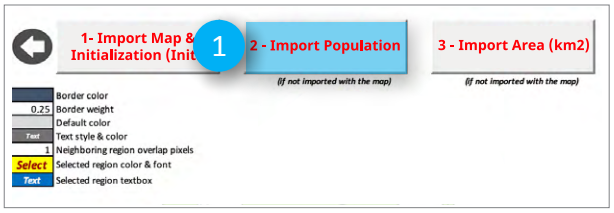


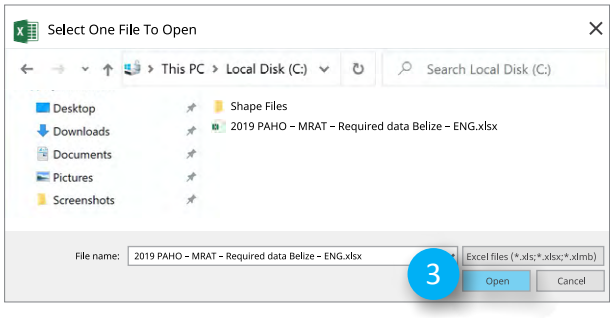
2.4 | IMPORT POPULATION DATA

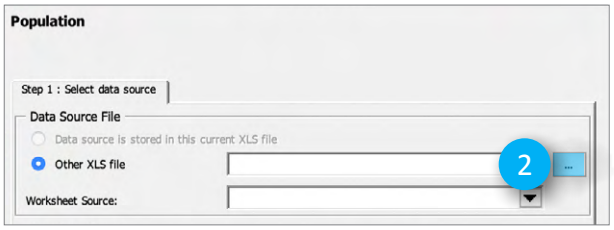
To import the population data, use the “Population and Area” sheet of the filled template.

In the “_GeoData_Maps” sheet of the tool, perform the following actions:

1. Click the “Import Population” button.
2. Click the browse file button [...].
3. Select the filled template file and click the “Open” button.
4. Switch back to the tool.



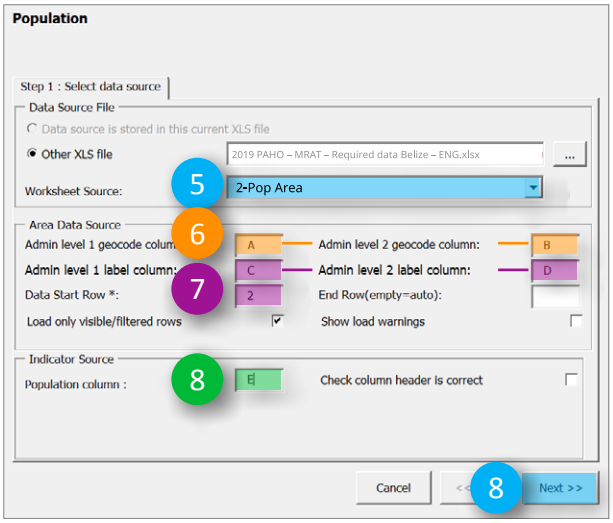




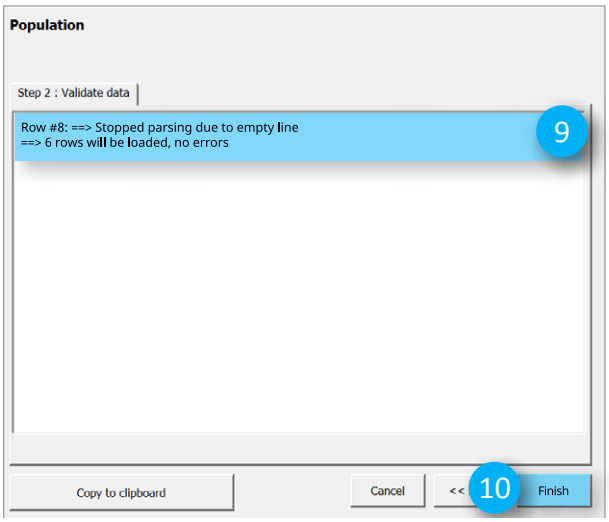
5. Select the sheet containing the population data.
6. Set the Admin1 and Admin2 source columns. If you are using the georeferencing codes to match the data between the Excel template and shapefile, then set the Admin1 and Admin2 code columns. Otherwise, if you are using the geographic names, set Admin1 and Admin2 label columns.
7. Set the number of the first data row.
8. Set the source column containing the population and click “Next”.

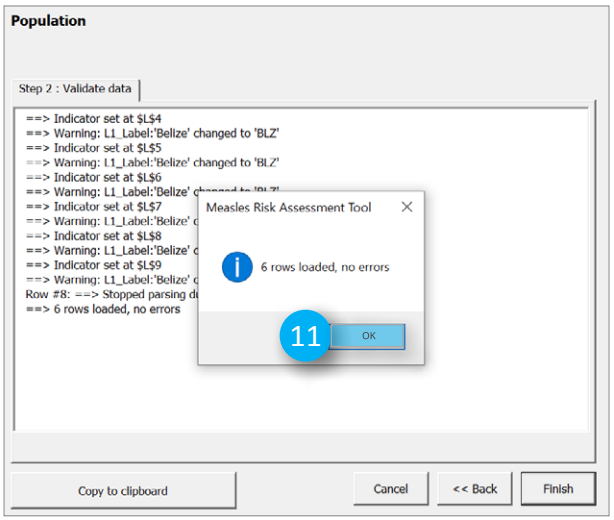
	A	B	C	D	E	F
1	Admin1 geo codes	Admin2 geo codes	Subnational level	Municipality	Pop_2019	Area (km2) of municipality
2	BLZ	BLZ.1_1	Belize	Belize	120,602	4,307.2
3	BLZ	BLZ.2_1	Belize	Cayo	96,197	5,195.6
4	BLZ	BLZ.3_1	Belize	Corozal	48,429	1,859.6
5	BLZ	BLZ.4_1	Belize	Orange Walk	51,749	4,636.1
6	BLZ	BLZ.5_1	Belize	Stann Creek	43,944	2,553.7
7	BLZ	BLZ.6_1	Belize	Toledo	37,614	4,413.3

1-General | 2-Pop Area | 3-Population Immunity | 4-Program Performance | 5-Vulnerable Groups | 6-Case Based Data | 7-Rapid Response



9. Check the number of rows that will be imported (Admin2 level).
10. Click the “Finish” button.
11. Click the “OK” button and review the imported data in the target column.





This is the result:

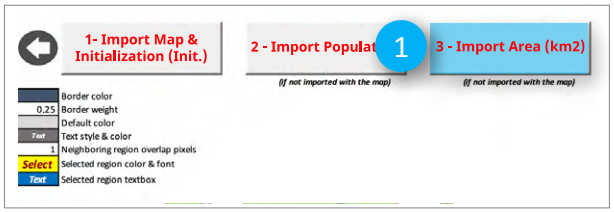
Admin1_Id	Admin1_Label	Admin1_Alternate	Admin2_Id	Admin2_Label	Admin2_Alternate	Population
BLZ	Belize		BLZ.1_1	Belize		120,602
BLZ	Belize		BLZ.2_1	Cayo		96,197
BLZ	Belize		BLZ.3_1	Corozal		48,429
BLZ	Belize		BLZ.4_1	Orange Walk		51,749
BLZ	Belize		BLZ.5_1	Stann Creek		43,944
BLZ	Belize		BLZ.6_1	Toledo		37,614
Total					**6**	**133,307**

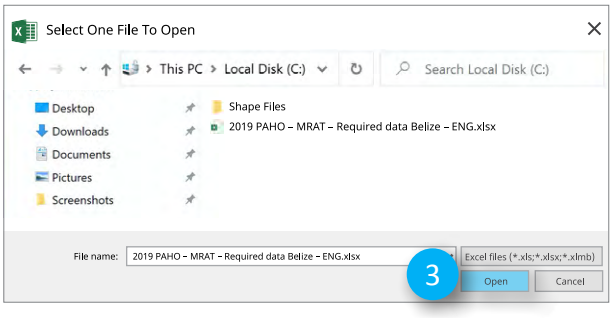
2.5 | IMPORT AREAS

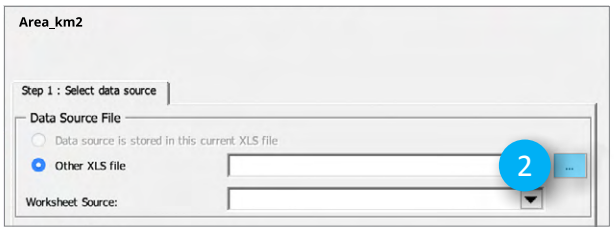
To import the areas, which must be in km^2, use the “Population and Area” sheet of the filled template.

In the “_GeoData_Maps” sheet of the tool, perform the following actions:

1. “Import Area (km2)”.
2. Click the browse file button  .
3. Select the filled template file and click the “Open” button.
4. Switch back to the tool.



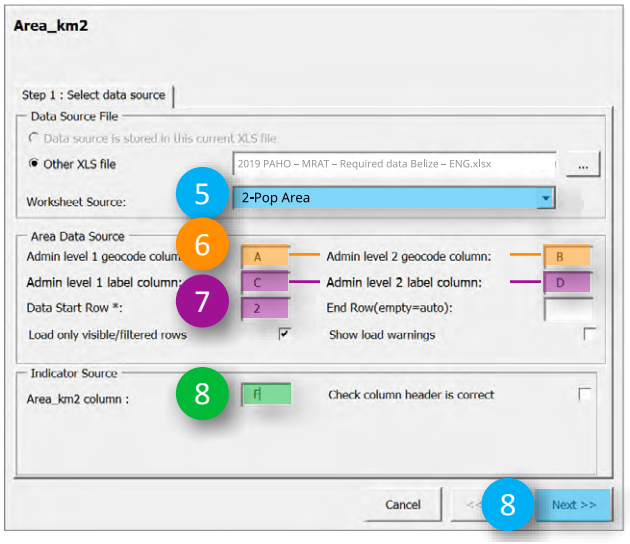




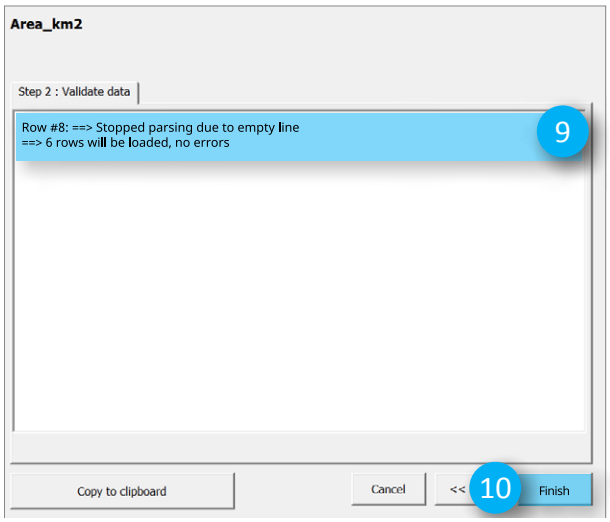
5. Select the sheet containing the area data.
6. Set the Admin1 and Admin2 source columns. If you are using the georeferencing codes to match the data between the Excel template and shapefile, then set the Admin1 and Admin2 code columns. Otherwise, if you are using the geographic names, set Admin1 and Admin2 label columns.
7. Set the number of the first data row.
8. Set the source column containing the area and click “Next”.

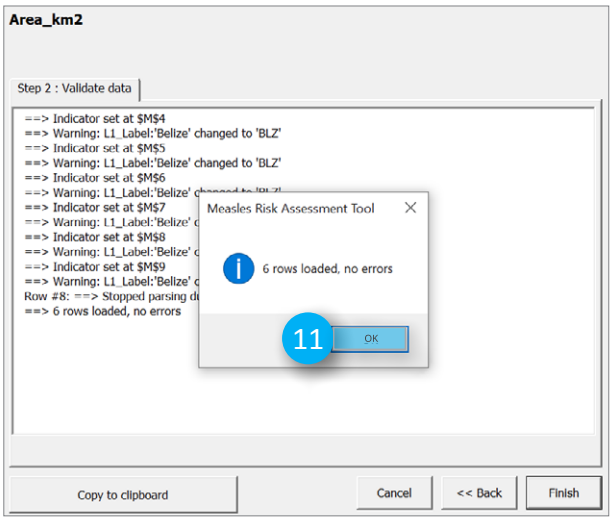
	A	B	C	D	E	F
1	Admin1 geo codes	Admin2 geo codes	Subnational level	Municipality	Pop_2019	Area (km2) of municipality
2	BLZ	BLZ.1_1	Belize	Belize	120,602	4,307.2
3	BLZ	BLZ.2_1	Belize	Cayo	96,197	5,195.6
4	BLZ	BLZ.3_1	Belize	Corozal	48,429	1,859.6
5	BLZ	BLZ.4_1	Belize	Orange Walk	51,749	4,636.1
6	BLZ	BLZ.5_1	Belize	Stann Creek	43,944	2,553.7
7	BLZ	BLZ.6_1	Belize	Toledo	37,614	4,413.3

1-General | 2-Pop Area | 3-Population Immunity | 4-Program Performance | 5-Vulnerable Groups | 6-Case Based Data | 7-Rapid Response



9. Check the number of rows that will be imported (Admin2 level).
10. Click the “Finish” button.
11. Click the “OK” button and review the imported data in the target column.





This is the result:

Admin1_Id	Admin1_Label	Admin1_Alternate	Admin2_Id	Admin2_Label	Admin2_Alternate	Population	Area_km2
BLZ	Belize		BLZ.1_1	Belize		120,602	4,307.2
BLZ	Belize		BLZ.2_1	Cayo		96,197	5,195.6
BLZ	Belize		BLZ.3_1	Corozal		48,429	1,859,6
BLZ	Belize		BLZ.4_1	Orange Walk		51,749	4,636.1
BLZ	Belize		BLZ.5_1	Stann Creek		43,944	2,553.7
BLZ	Belize		BLZ.6_1	Toledo		37,614	4,413.3
Total					6	133,307	11,603.1

Note: Enter 1 under the column titled "Is disputed" when there is an area under dispute that was included in the shapefile and for which total population and/or area (in km^2) may or may not been included. The tool will render it in gray color in the risk maps.

2.6 | MANAGE ALTERNATIVE NAMES (ALIASES) FOR ADMIN1 AND ADMIN2 GEOGRAPHIC SITES

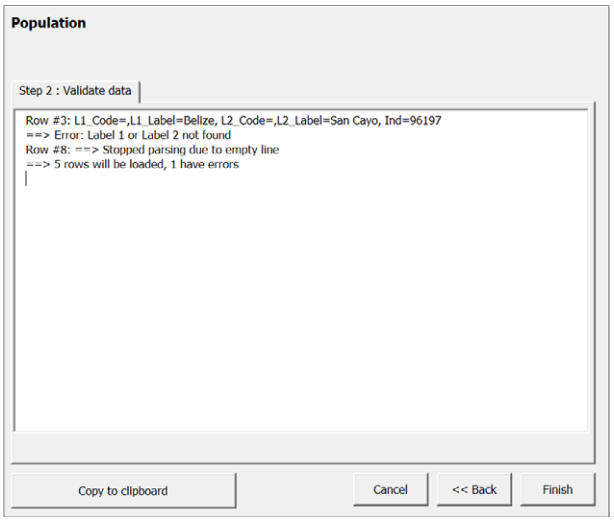
The names of some subnational and municipality sites may differ between the shapefile and those stored in the Excel template, such as population data, geographic areas, case-based data, vulnerable groups, and administrative coverage data. If the names of subnational/municipality levels do not match exactly between ALL data sources (including exact spelling), then we have two options to resolve this issue:

1. **List all versions of the subnational/municipality names on the "_GeoData_Maps" sheet.**

Aliases must be added in the "_GeoData_Maps" sheet, in the columns labeled "Admin 1_Alternative" and "Admin2_ Alternative" prior to all data import and/or copy–paste of population, geographic areas, case-based data, vulnerable groups, and all other administrative data.

To this end, when importing data, the Risk Assessment Tool detects and displays any subnational and municipality levels with a name that does not match with the subnational and municipality names in the map.

After importing data, the error display box will show any areas with unmatching names. Click on Copy to clipboard at the bottom to copy the output content message in a clipboard and paste into a text editor (like Notepad or Notepad++). In the example shown below, the municipality "San Cayo" is not recognized by the Risk Assessment Tool (error display box at right). Indeed, the alternate version of the municipality name that was imported from the shapefile is "Cayo" (see geodata box below). "Cayo" must be added as an alias for "San Cayo" in the Admin2_Alternate column (below).



To do so:

1. Finish the Data Import action by clicking the "Finish" button.
2. On the "_GeoData_Maps" sheet:
3. Find the name "San Cayo" in Admin2_label column and enter "Cayo" in the "Admin2_Alternate" column.
4. If two or more aliases exist for a municipality, they can be listed with a comma separating the aliases: Cayo, Cayo St.
5. Complete the steps to import the data again. The Risk Assessment Tool will use the new alias to match the municipality name and import all data.

Admin1_Label	Admin1_Alternate	Admin2_Id	Admin2_Label	Admin2_Alternate
BLZ		BLZ.1_1	Belize	
BLZ		BLZ.2_1	San Cayo	Cayo
BLZ		BLZ.3_1	Corozal	
BLZ		BLZ.4_1	Orange Walk	
BLZ		BLZ.5_1	Stann Creek	
BLZ		BLZ.6_1	Toledo	

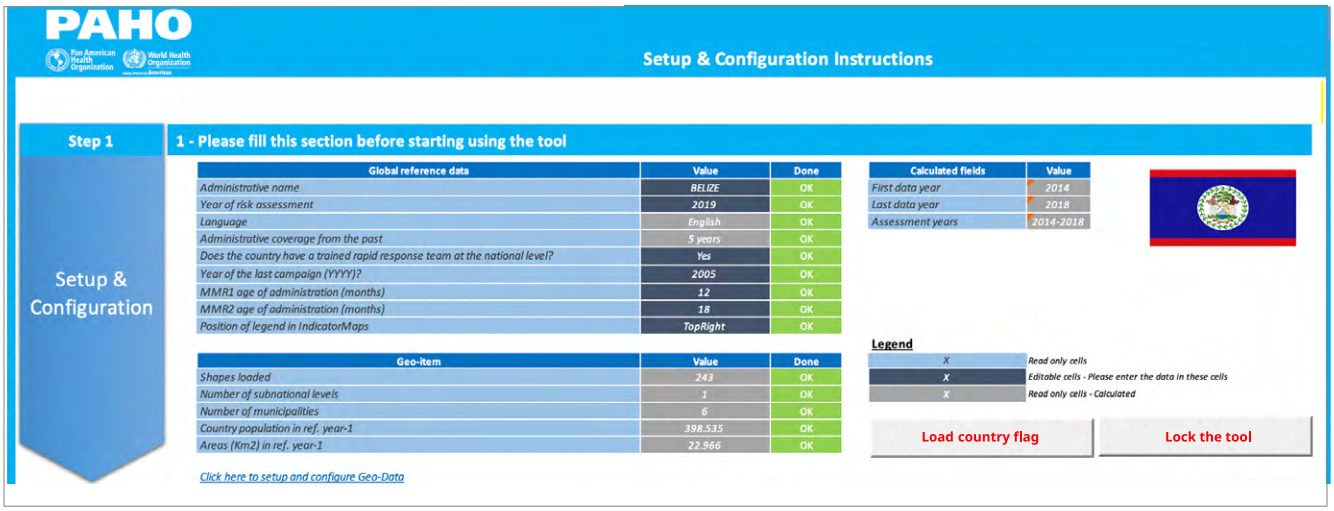
2. Use the Admin1 and Admin 2 georeferencing codes

If Admin1 and Admin2 georeferencing codes from the shapefiles were included in the Excel workbook, then they will be used to match the municipalities; otherwise, the names should be used.
To do so, the columns A and B should have the georeferencing codes for Admin1 and Admin2, respectively. These codes should be included in all sheets of the Excel workbook with exception of Case-Based Data.

Admin1 geo codes	Admin2 geo codes	Subnational level	Municipality	Pop_2019	Area (km2) of municipality
BLZ	BLZ.1_1	Belize	Belize	120,602	4307.2
BLZ	BLZ.2_1	Belize	Cayo	96,197	5195.6
BLZ	BLZ.3_1	Belize	Corozal	48,429	1859.6
BLZ	BLZ.4_1	Belize	Orange Walk	51,749	4636.1
BLZ	BLZ.5_1	Belize	Stann Creek	43,944	2553.7
BLZ	BLZ.6_1	Belize	Toledo	37,614	4413.3

2.7 | CHECK THE SETUP AND CONFIGURATION

In the “Setup & Configuration” sheet, make sure that all required actions have been completed. To do so, check the status of each global variable and each geodata item. The “Done” column must display an “OK” and have turned green in color.



2.8 | LOCK THE TOOL

The tool should be locked after its setup and configuration are completed. This action is highly advisable to protect the formulas in different sheets of the tool. To lock the tool, perform the following actions in the "Setup & Configuration" sheet:

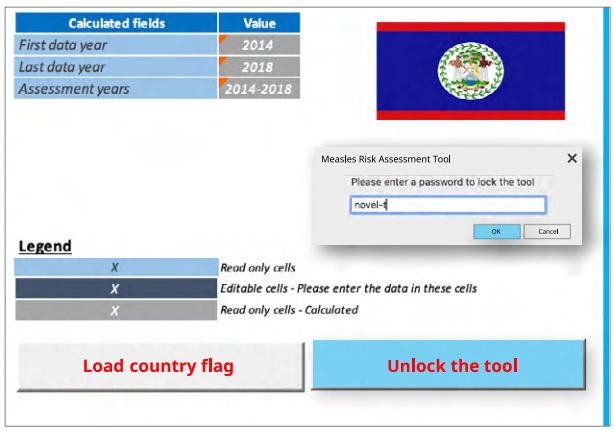
1. Click the "Lock the tool" button.
2. Enter a password and click "OK".
3. Confirm your password and click "OK".
4. Only dark blue cells will be editable.

2.9 | UNLOCK THE TOOL

The tool can be unlocked after locking it. To do so, in the "Setup & Configuration" sheet, perform the two following actions:

1. Click the "Unlock the tool" button.
2. Enter the password and click "OK".

Users are recommended to keep the tool locked during use. Unlock the tool only when there is a need to modify the geographic reference data.

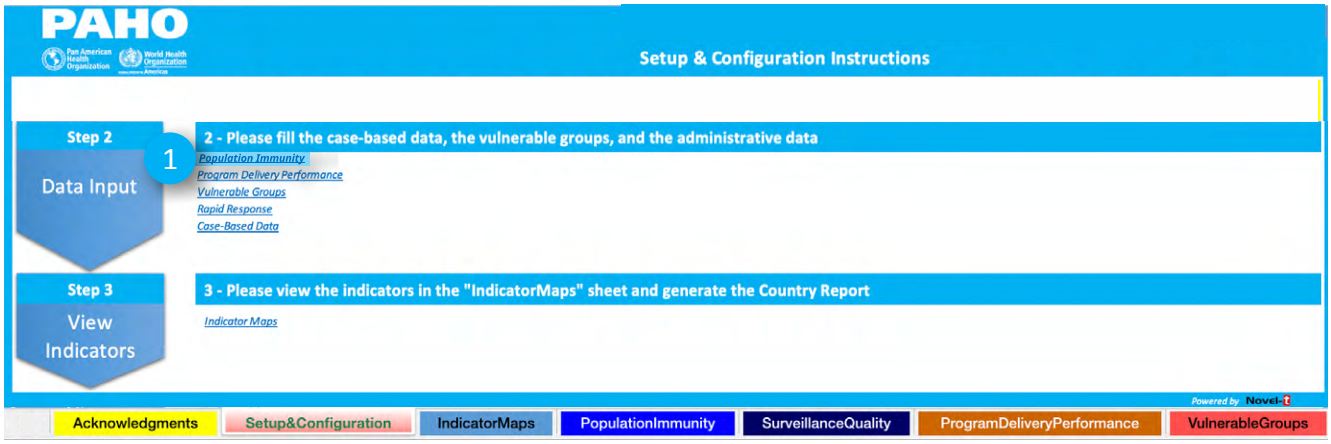


3 IMPORT THE DATA

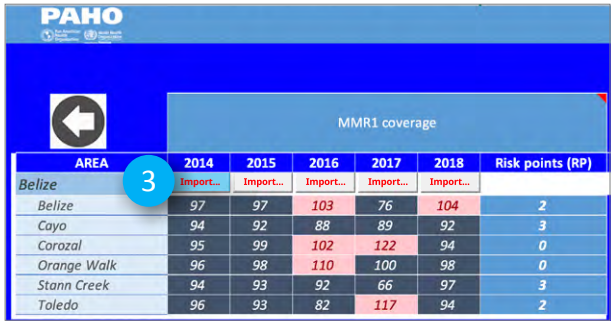
3.1 | IMPORT POPULATION IMMUNITY DATA

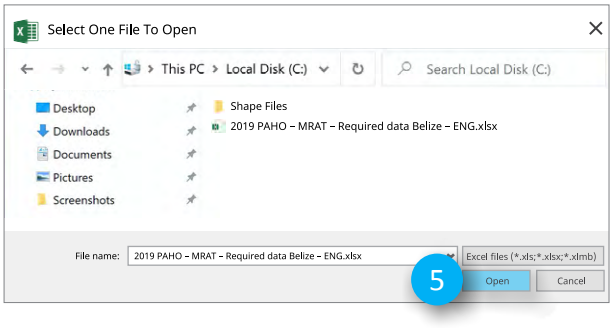
Use the “Population Immunity” sheet of the filled template to populate this category of the tool.

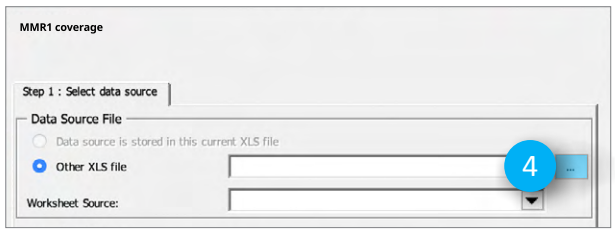
1. In the “Setup & Configuration” sheet, click the “Population Immunity” link or navigate to the “Population Immunity” sheet.



2. Import the data from the filled template file for each indicator as follows.
3. Click the “Import” button of the indicator to import.
4. Click the browse file button [...].
5. Select the filled template file and click the “Open” button.
6. Switch back to the tool.







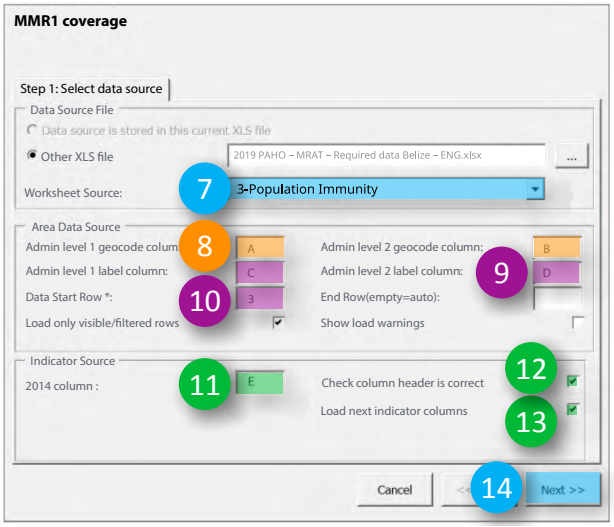
In the data import pane:

7. Select the sheet containing the data to import: “Population Immunity”.
8. Set the Admin1 and Admin2 georeferencing codes if they are available; if not leave them blank. Refer to section 2.6 on page 22 for additional information.
9. Set the Admin1 and Admin2 source columns.

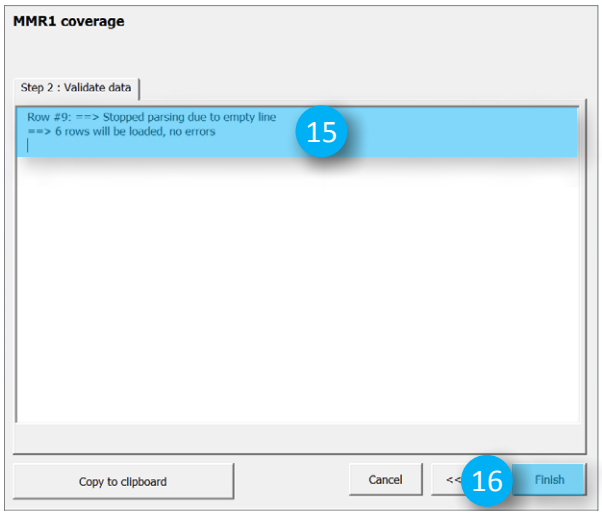
10. Set the number of the first data row.
11. Set the source column containing the data to import.
12. Select this check box if you want the tool to validate the year of importing data. This is an optional feature and is only available when there is a “Year” set in the Excel template.
13. Select this check box if you want the tool to import the five years of data at once. This feature is only available when you are importing the first year of data.
14. Then click “Next”.

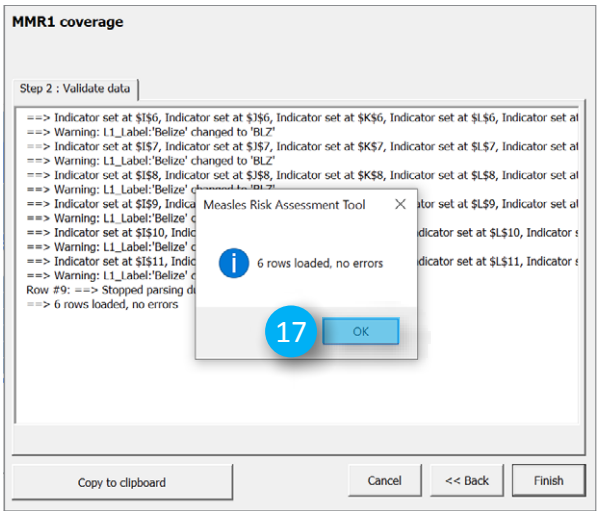
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Admin1 geo codes	Admin2 geo codes	Subnational level	Municipality	MMR1 coverage by municipality (in whole numbers)					MMR2 coverage by municipality (in whole numbers)					Coverage of the latest follow-up campaign (in whole numbers)
2					2014	2015	2016	2017	2018	2014	2015	2016	2017	2018	
3	BLZ	BLZ.1_1	Belize	Belize	97	97	103	76	104	92	98	95	80	95	94
4	BLZ	BLZ.2_1	Belize	Cayo	94	92	88	89	92	86	90	96	89	84	93
5	BLZ	BLZ.3_1	Belize	Corozal	95	99	102	122	94	94	94	100	108	93	97
6	BLZ	BLZ.4_1	Belize	Orange Walk	96	98	110	100	98	96	98	97	96	97	88
7	BLZ	BLZ.5_1	Belize	Stann Creek	94	93	92	66	97	90	98	98	79	92	97
8	BLZ	BLZ.6_1	Belize	Toledo	96	93	82	117	94	92	97	90	84	82	88

1-General | 2-Pop Area | 3-Population Immunity | 4-Program Performance | 5-Vulnerable Groups | 6-Case Based Data | 7-Rapid Response

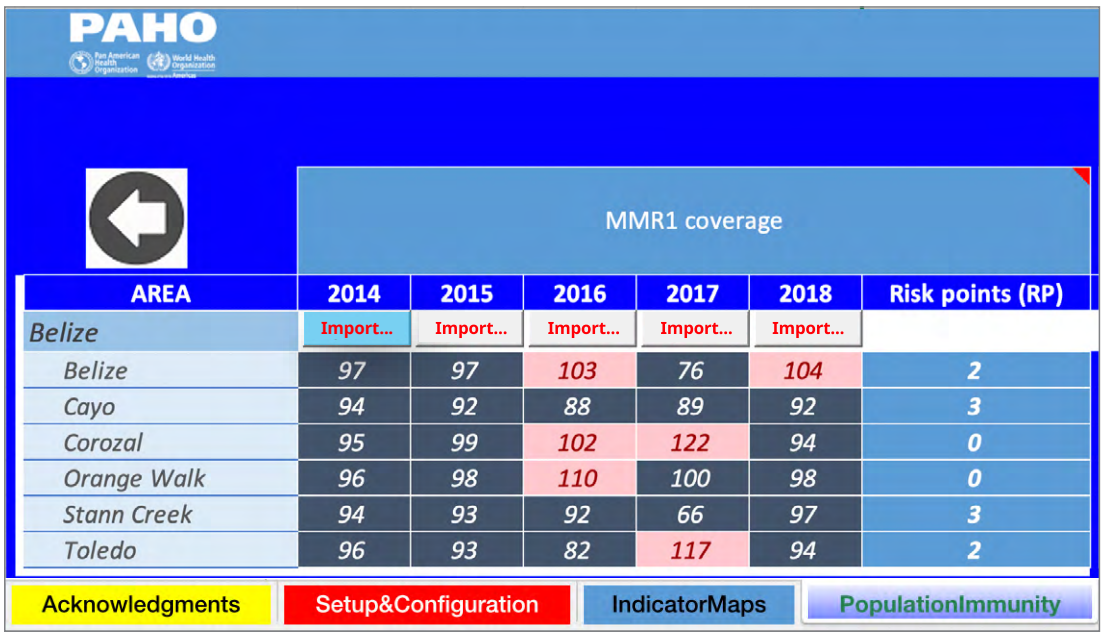


15. Check the number of the rows that will be imported (Admin2 level).
16. Click the “Finish” button.
17. Click the “OK” button and review the imported data in the target column.
18. Perform the same steps to import the data for the other years.





This is the result:

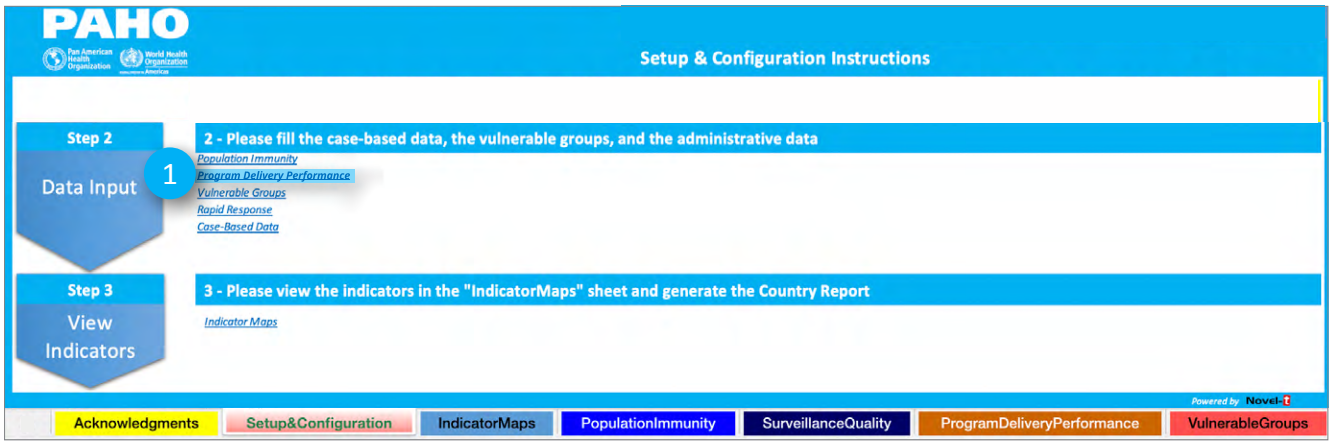


Note: The tool will not assign any risk point if the reported coverage is greater than 100%; rather it will highlight this value with a red color calling for a root analysis of the potential causes.

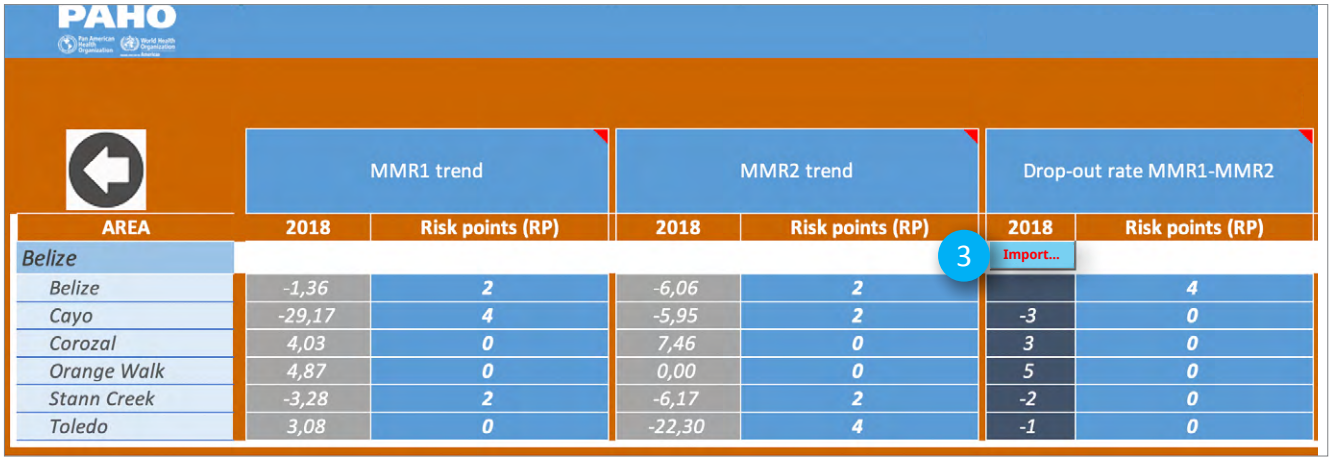
3.2 | IMPORT PROGRAM DELIVERY PERFORMANCE DATA

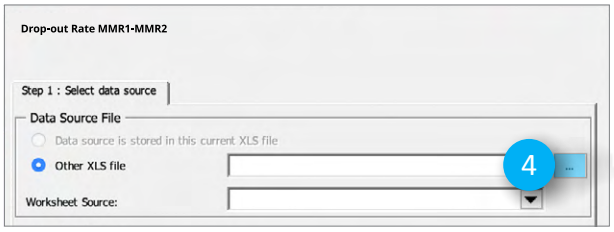
To import the Program Delivery data, use the “Program Performance” sheet of the filled template.

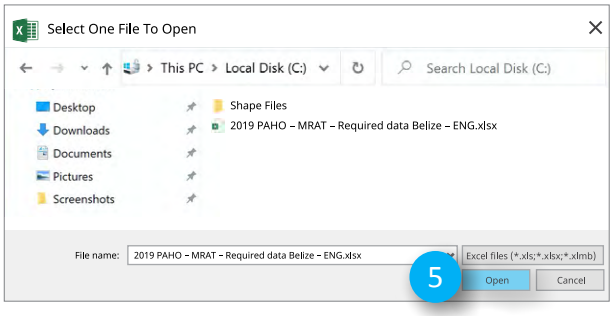
1. In the “Setup & Configuration” sheet, click the “Program Delivery Performance” link or navigate to the “Program Delivery Performance” sheet.



2. Import the data from the filled template file for each indicator as follows.
3. Click the “Import” button of the indicator to import.
4. Click the browse file button [...].
5. Select the filled template file and click the “Open” button.
6. Switch back to the tool.





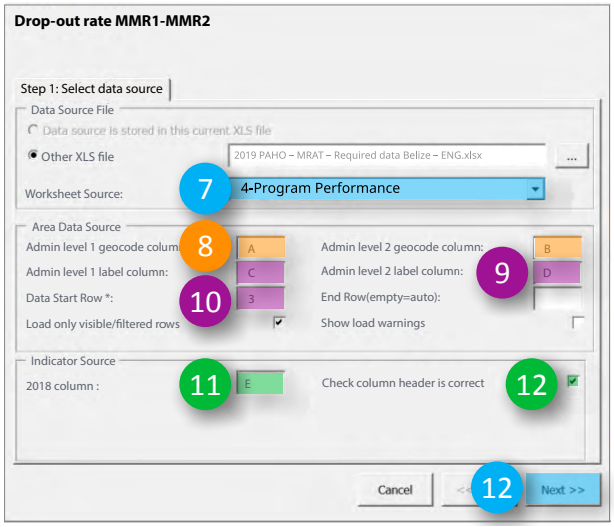


In the data import pane:

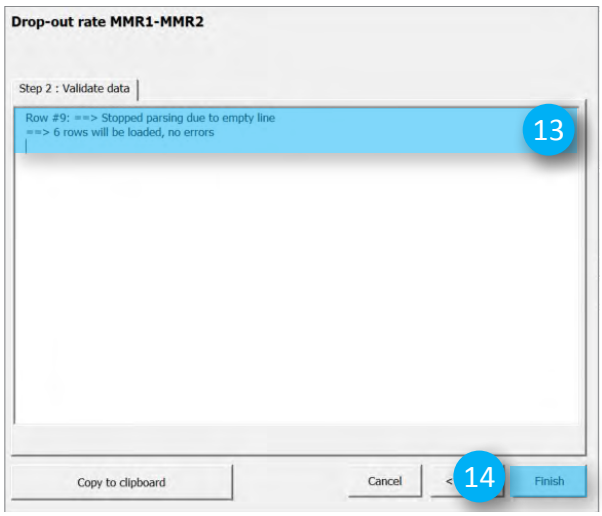
7. Select the sheet containing the data source to import: “Program Performance”.
8. Set the Admin1 and Admin2 georeferencing codes if they are available; if not leave them blank. Refer to section 2.6 on page 22 for additional information.
9. Set the Admin1 and Admin2 source columns.
10. Set the number of the first data row.
11. Set the source column containing the data to import.
12. Select this check box if you want the tool to validate the year of importing data and click “Next”.

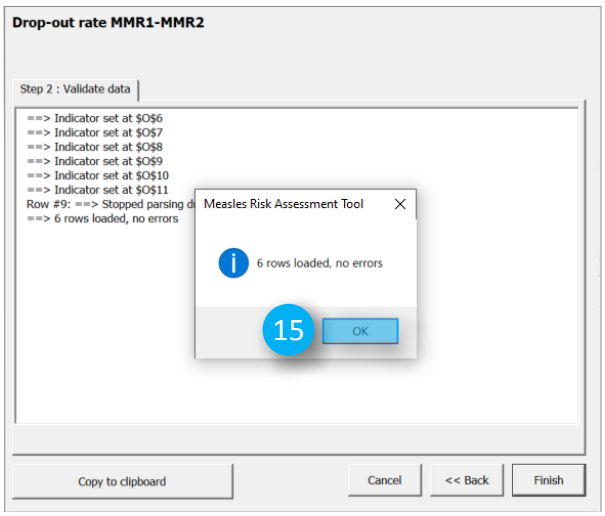
	A	B	C	D	E	F	G	H	I
1	Admin1 geo codes	Admin2 geo codes	Subnational level	Municipality	Number of doses Penta1	Number of doses of MMR1	Number of doses of MMR2	Drop-out formula No. of doses (MMR1 – MMR2) / No. of doses MMR1	Drop-out formula No. of doses (Penta1 – MMR1) / No. of doses Penta1
2					2018	2018	2018	2018	2018
3	BLZ	BLZ.1_1	Belize	Belize	1,839	1,677	1,531	8.7	8.8
4	BLZ	BLZ.2_1	Belize	Cayo	1,636	1,683	1,556	7.5	-2.8
5	BLZ	BLZ.3_1	Belize	Corozal	717	693	688	0.7	3.3
6	BLZ	BLZ.4_1	Belize	Orange Walk	1,025	976	963	1.3	4.7
7	BLZ	BLZ.5_1	Belize	Stann Creek	979	996	940	5.6	-1.7
8	BLZ	BLZ.6_1	Belize	Toledo	597	605	541	10.5	-1.3

1-General | 2-Pop Area | 3-Population Immunity | **4-Program Performance** | 5-Vulnerable Groups | 6-Case Based Data | 7-Rapid Response

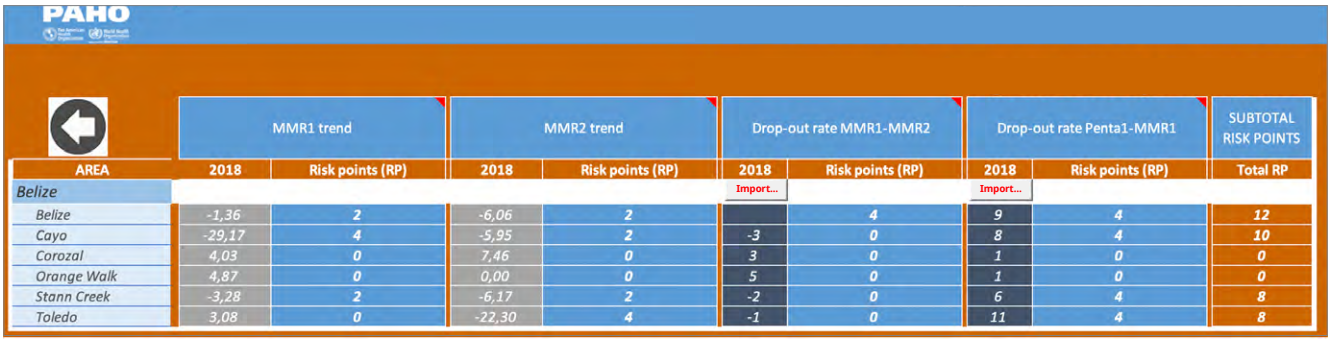


13. Check the number of the rows that will be imported (Admin2 level).
14. Click the “Finish” button.
15. Click the “OK” button and review the imported data in the target column.
16. Perform the same steps to import the data for the other indicators.





This is the result:



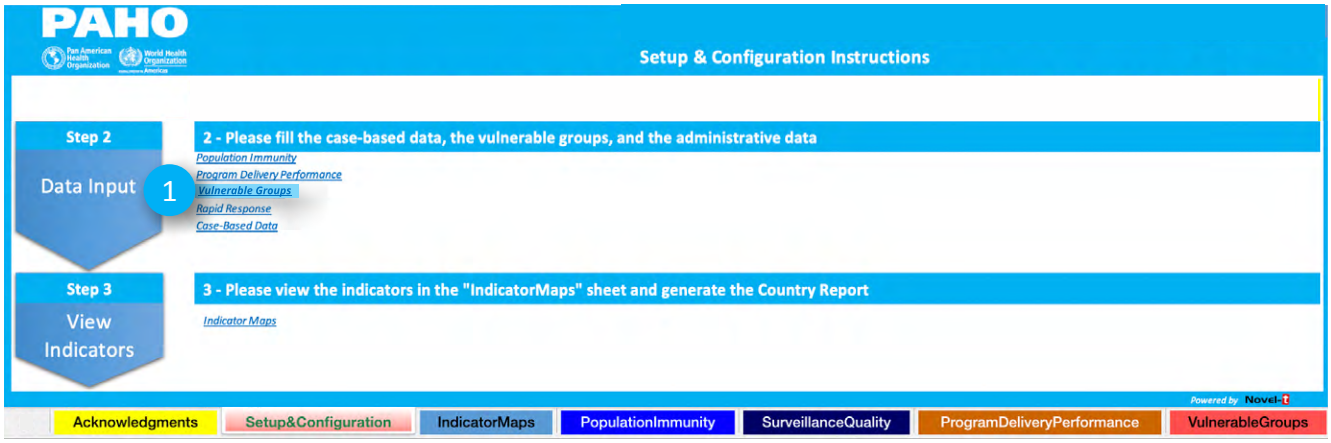
AREA	MMR1 trend 2018	MMR1 trend Risk points (RP)	MMR2 trend 2018	MMR2 trend Risk points (RP)	Drop-out rate MMR1-MMR2 2018	Drop-out rate MMR1-MMR2 Risk points (RP)	Drop-out rate Penta1-MMR1 2018	Drop-out rate Penta1-MMR1 Risk points (RP)	SUBTOTAL RISK POINTS Total RP
Belize					Import...		Import...		
Belize	-1,36	2	-6,06	2		4	9	4	12
Cayo	-29,17	4	-5,95	2	-3	0	8	4	10
Corozal	4,03	0	7,46	0	3	0	1	0	0
Orange Walk	4,87	0	0,00	0	5	0	1	0	0
Stann Creek	-3,28	2	-6,17	2	-2	0	6	4	8
Toledo	3,08	0	-22,30	4	-1	0	11	4	8

Note: The variables MMR1 trend and MMR2 trend are automatically calculated by the tool using the vaccination coverage data input in the Population Immunity category.

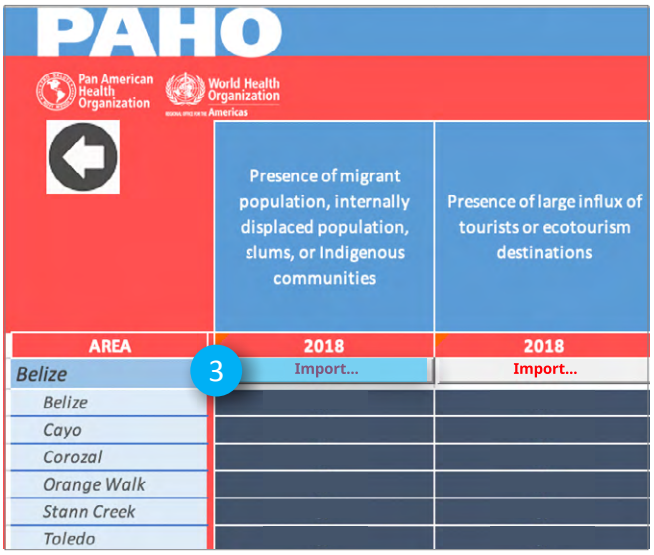
3.3 | IMPORT VULNERABLE GROUPS DATA

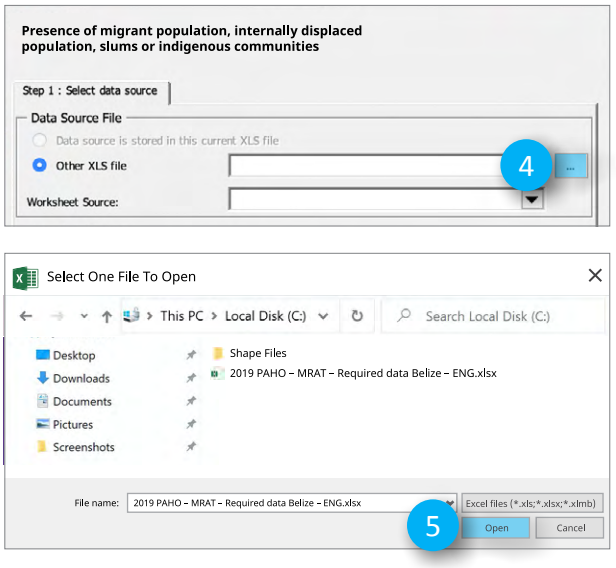
To import the Vulnerable Groups data, use the "Vulnerable Groups" sheet of the filled template.

1. In the "Setup & Configuration" sheet, click the "Vulnerable Groups" link or navigate to the "Vulnerable Groups" sheet.



2. Import the data from the filled template file for each indicator as follows.
3. Click the "Import" button of the variable to import.
4. Click the browse file button ....
5. Select the filled template file and click the "Open" button.
6. Switch back to the tool.



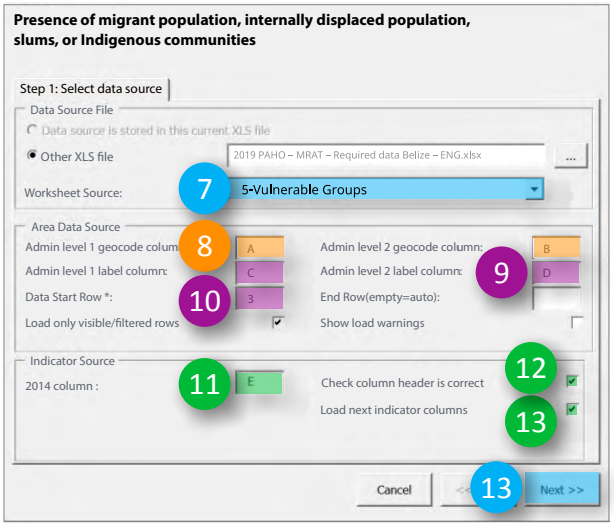


In the data import pane:

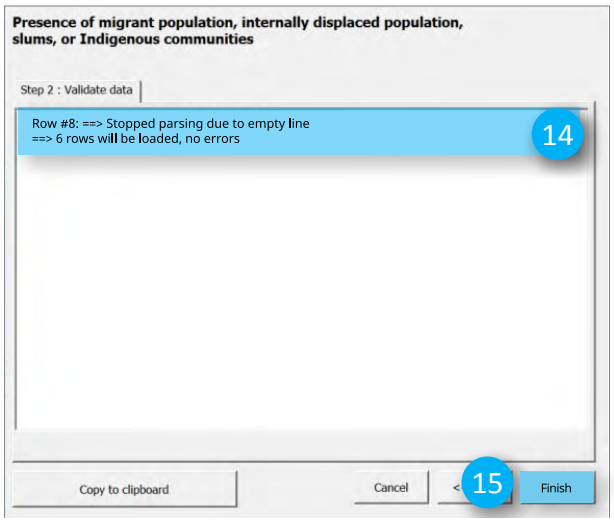
7. Select the sheet containing the data source to import: “Vulnerable Groups”.
8. Set the Admin1 and Admin2 georeferencing codes if they are available; if not leave them blank. Refer to section 2.6 on page 22 for additional information.
9. Set the Admin1 and Admin2 source columns.
10. Set the number of the first data row.
11. Set the source column containing the data to import.
12. Select this check box if you want the tool to validate the year of importing data.
13. Select this check box if you want the tool to import the all 10 variables at once. This feature is only available when you are importing the first variable. Then click “Next”.

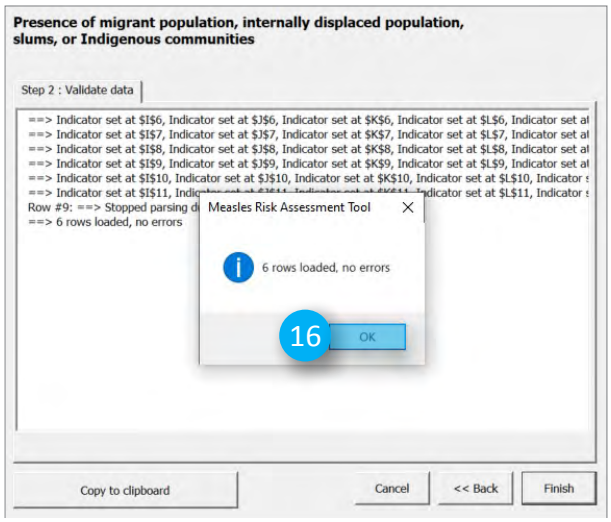
	A	B	C	D	E	F	G	H	I	J
1	Admin1 geo codes	Admin2 geo codes	Subnational level	Municipality	Presence of migrants, internally displaced persons, slums, or Indigenous communities (Yes/No)	Presence of large influx of tourists or ecotourism destinations (Yes/No)	Presence of security and safety concerns that hinders routine vaccination or epidemiological field investigation (e.g., drug trafficking) (Yes/No)	Presence of disasters or calamities (Yes/No)	Limited access to health services due to terrain/transportation issues (Yes/No)	Presence of high-traffic transportation hubs, major roads (within and across countries), or zones bordering large urban areas (Yes/No)
2					2018	2018	2018	2018	2018	2018
3	BLZ	BLZ.1_1	Belize	Belize	Yes	Yes	Yes	No	No	Yes
4	BLZ	BLZ.2_1	Belize	Cayo	Yes	Yes	Yes	No	No	Yes
5	BLZ	BLZ.3_1	Belize	Corozal	Yes	Yes	Yes	No	No	Yes
6	BLZ	BLZ.4_1	Belize	Orange Walk	Yes	Yes	Yes	No	No	Yes
7	BLZ	BLZ.5_1	Belize	Stann Creek	Yes	Yes	Yes	No	Yes	Yes
8	BLZ	BLZ.6_1	Belize	Toledo	Yes	Yes	Yes	No	Yes	Yes

1-General | 2-Pop Area | 3-Population Immunity | 4-Program Performance | 5-Vulnerable Groups | 6-Case Based Data | 7-Rapid Response

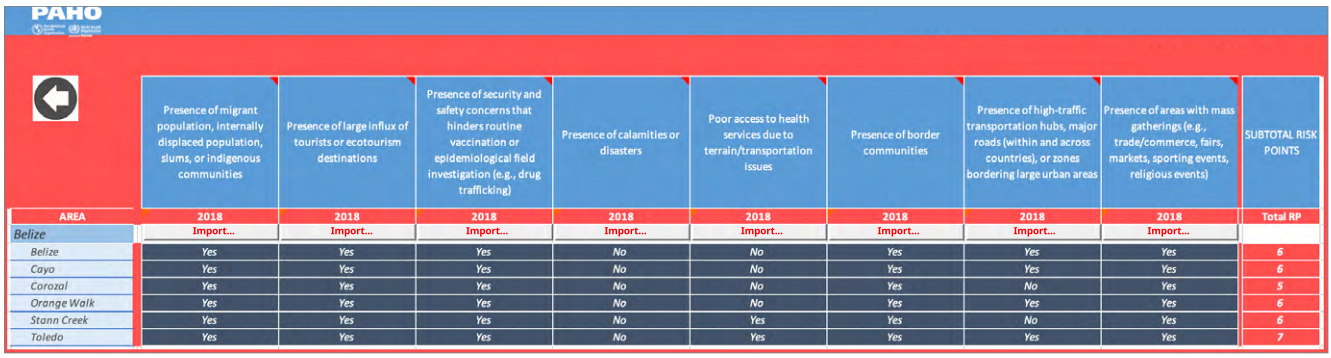


14. Check the number of rows that will be imported (Admin2 level).
15. Click the “Finish” button.
16. Click the “OK” button and review the imported data in the target column.





This is the result:

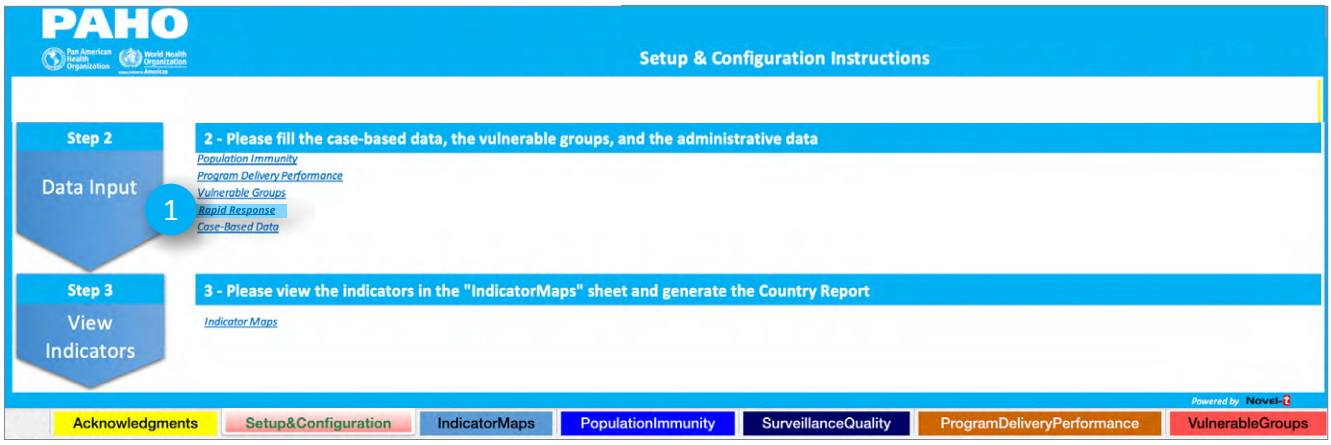


AREA	Presence of migrant population, internally displaced population, slums, or indigenous communities	Presence of large influx of tourists or ecotourism destinations	Presence of security and safety concerns that hinders routine vaccination or epidemiological field investigation (e.g., drug trafficking)	Presence of calamities or disasters	Poor access to health services due to terrain/transportation issues	Presence of border communities	Presence of high-traffic transportation hubs, major roads (within and across countries), or zones bordering large urban areas	Presence of areas with mass gatherings (e.g., trade/commerce, fairs, markets, sporting events, religious events)	SUBTOTAL RISK POINTS
	2018	2018	2018	2018	2018	2018	2018	2018	Total RP
Belize	Import...	Import...	Import...	Import...	Import...	Import...	Import...	Import...	
Belize	Yes	Yes	Yes	No	No	Yes	Yes	Yes	6
Cayo	Yes	Yes	Yes	No	No	Yes	Yes	Yes	6
Corozal	Yes	Yes	Yes	No	No	Yes	No	Yes	5
Orange Walk	Yes	Yes	Yes	No	No	Yes	Yes	Yes	6
Stann Creek	Yes	Yes	Yes	No	Yes	Yes	No	Yes	6
Toledo	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	7

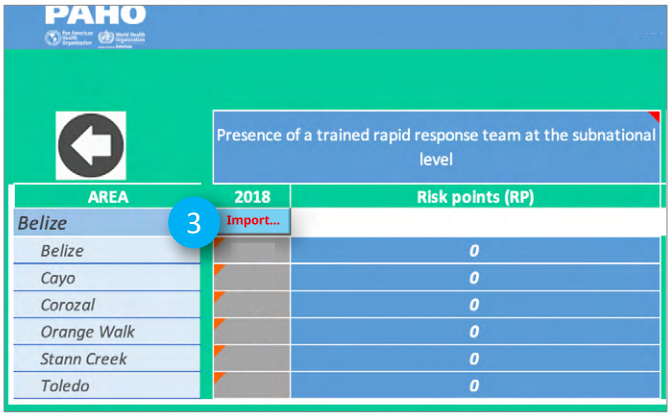
3.4 | IMPORT RAPID RESPONSE DATA

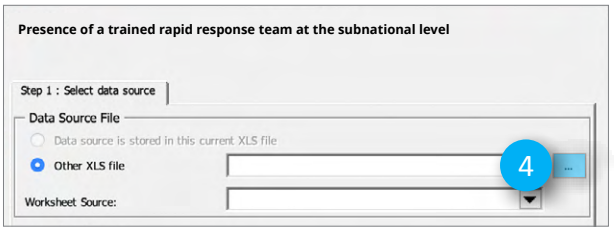
To import the Rapid Response data, use the “Rapid Response” sheet of the filled template.

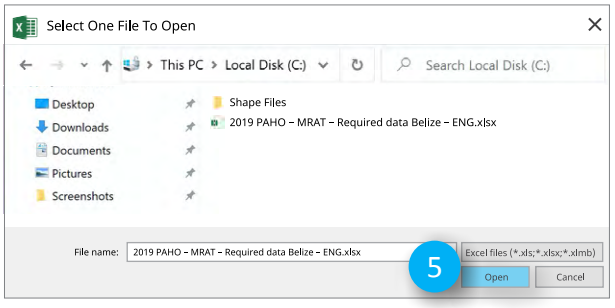
1. In the “Setup & Configuration” sheet, click the “Rapid Response” link or navigate to the “Rapid Response” sheet.
2. Import the data from the filled template file for each variable as follows:



3. Click the “Import” button of the indicator to import.
4. Click the browse file button [...].
5. Select the filled template file and click the “Open” button.
6. Switch back to the tool.





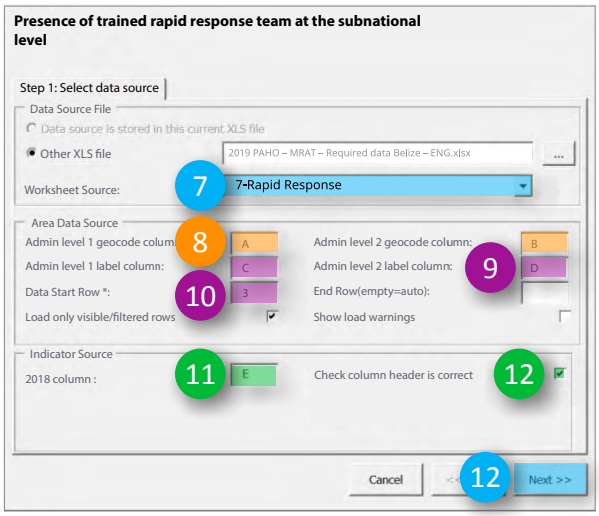


In the data import pane:

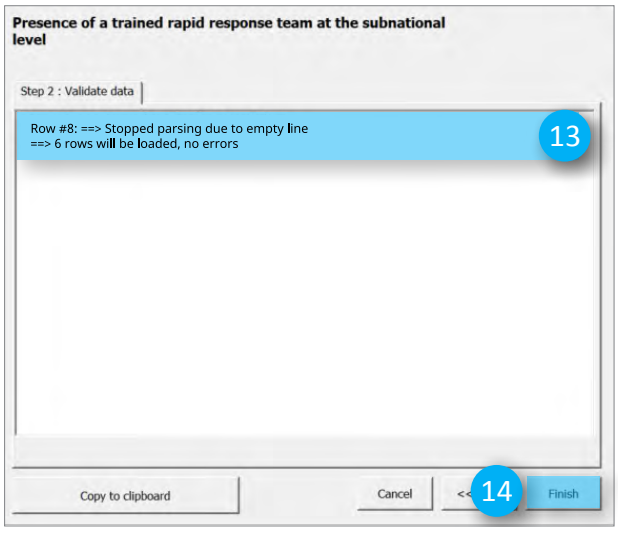
7. Select the sheet containing the data to import.
8. Set the Admin1 and Admin2 georeferencing codes if they are available; if not leave them blank. Refer to section 2.6 on page 22 for additional information.
9. Set the Admin1 and Admin2 source columns.
10. Set the number of the first data row.
11. Set the source column containing the data to import.
12. Select this check box if you want the tool to validate the year of importing data. Then click “Next”

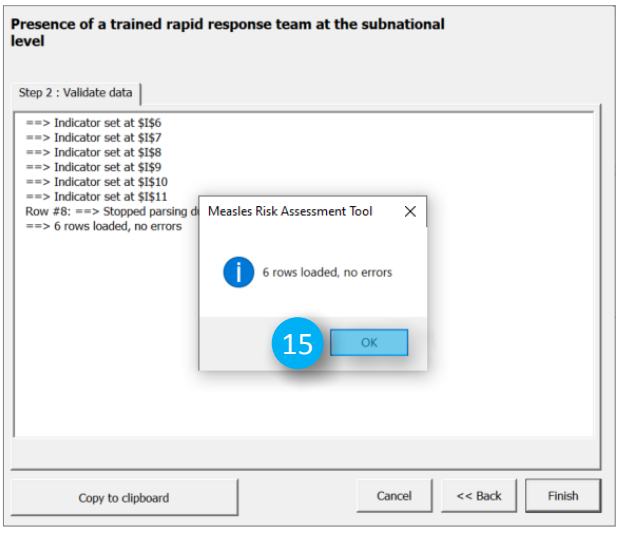
	A	B	C	D	E	F
1	Admin1 geo codes	Admin2 geo codes	Subnational	Municipality	Presence of a trained rapid response team at the subnational level (Yes/No)	Percentage of subnational hospitals with trained staff to do triage and isolation for measles/rubella highly suspected cases (in whole numbers)
2	BLZ	BLZ.1_1	Belize	Belize	Yes	50
3	BLZ	BLZ.2_1	Belize	Cayo	Yes	100
4	BLZ	BLZ.3_1	Belize	Corozal	Yes	100
5	BLZ	BLZ.4_1	Belize	Orange Walk	Yes	100
6	BLZ	BLZ.5_1	Belize	Stann Creek	Yes	50
7	BLZ	BLZ.6_1	Belize	Toledo	Yes	100

1-General | 2-Pop Area | 3-Population Immunity | 4-Program Performance | 5-Vulnerable Groups | 6-Case Based Data | 7-Rapid Response

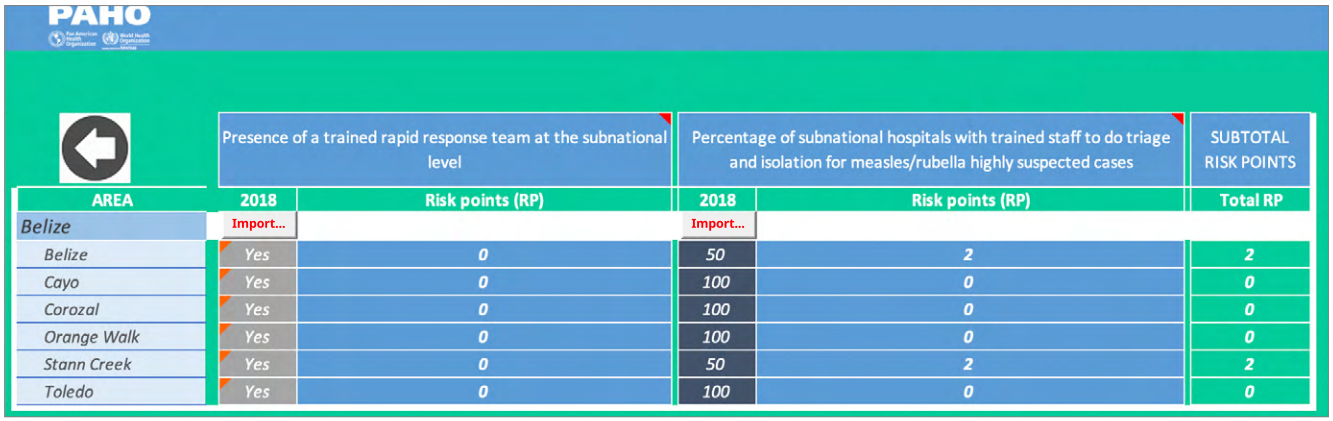


13. Check the number of rows that will be imported (Admin2 level).
14. Click the “Finish” button.
15. Click the “OK” button and review the imported data in the target column.





This is the result:

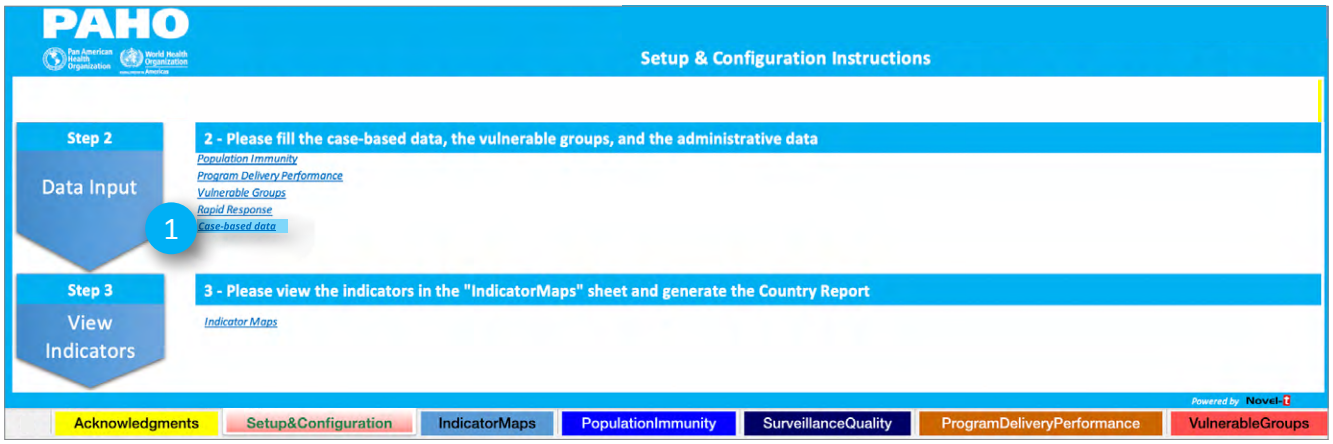


AREA	Presence of a trained rapid response team at the subnational level		Percentage of subnational hospitals with trained staff to do triage and isolation for measles/rubella highly suspected cases		SUBTOTAL RISK POINTS
	2018	Risk points (RP)	2018	Risk points (RP)	Total RP
Belize	Import...		Import...		
Belize	Yes	0	50	2	2
Cayo	Yes	0	100	0	0
Corozal	Yes	0	100	0	0
Orange Walk	Yes	0	100	0	0
Stann Creek	Yes	0	50	2	2
Toledo	Yes	0	100	0	0

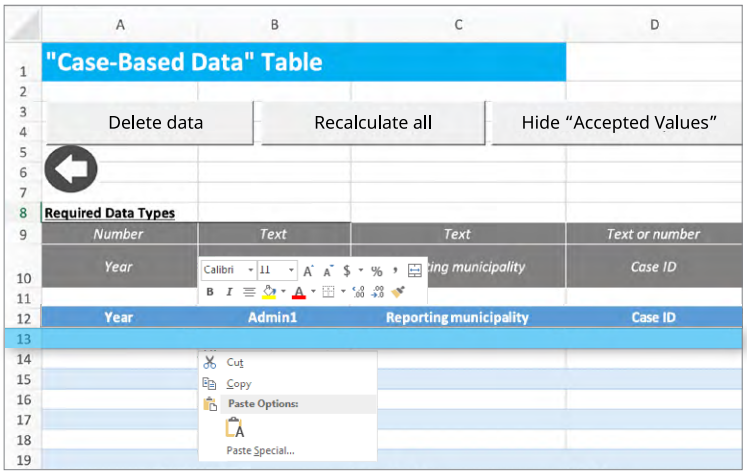
3.5 | IMPORT CASE-BASED DATA

To import the case-based data, use the “Case-Based Data” sheet of the filled template.

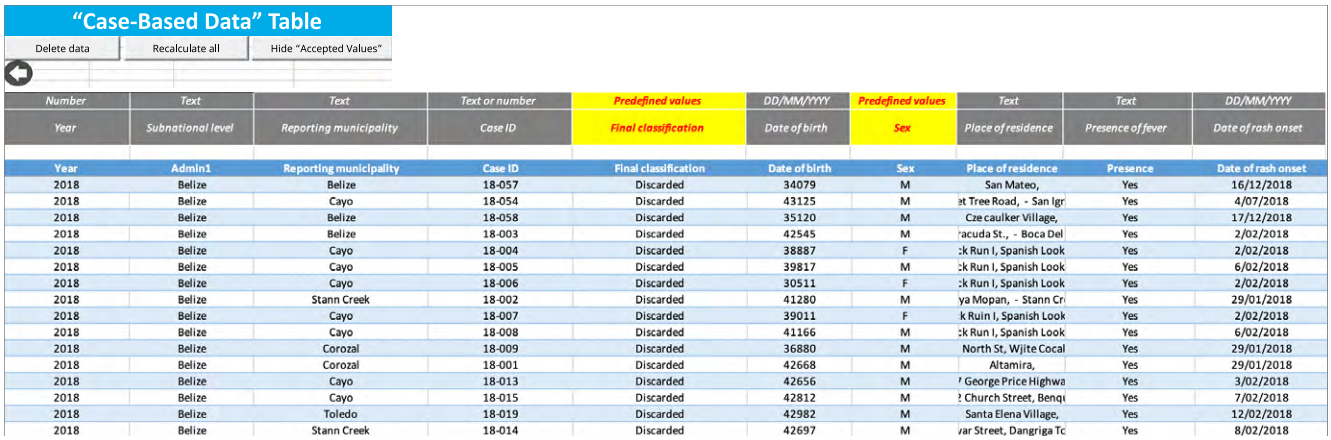
1. In the “Setup & Configuration” sheet, click the “Case-Based Data” link or navigate to the “Case-Based Data” sheet.
2. Open the filled template and select the “Case-Based Data” sheet.



3. In the filled template file select and copy the data table without selecting the headers. Click a data cell of the data table and type <CTRL><A> to select all data cells then type <CTRL><C> to copy the selected data.



4. Switch back to the tool and paste the data:
    4.1. Click "A14" cell in the "Case-Based Data" sheet of the tool.
    4.2. Right click and paste the data as values.



Number	Text	Text	Text or number	Predefined values	DD/MM/YYYY	Predefined values	Text	Text	DD/MM/YYYY
Year	Subnational level	Reporting municipality	Case ID	Final classification	Date of birth	Sex	Place of residence	Presence of fever	Date of rash onset
Year	Admin1	Reporting municipality	Case ID	Final classification	Date of birth	Sex	Place of residence	Presence	Date of rash onset
2018	Belize	Belize	18-057	Discarded	34079	M	San Mateo,	Yes	16/12/2018
2018	Belize	Cayo	18-054	Discarded	43125	M	t Tree Road, - San Ign	Yes	4/07/2018
2018	Belize	Belize	18-058	Discarded	35120	M	Cze caulker Village,	Yes	17/12/2018
2018	Belize	Belize	18-003	Discarded	42545	M	acuda St., - Boca Del	Yes	2/02/2018
2018	Belize	Cayo	18-004	Discarded	38887	F	k Run I, Spanish Look	Yes	2/02/2018
2018	Belize	Cayo	18-005	Discarded	39817	M	k Run I, Spanish Look	Yes	6/02/2018
2018	Belize	Cayo	18-006	Discarded	30511	F	k Run I, Spanish Look	Yes	2/02/2018
2018	Belize	Stann Creek	18-002	Discarded	41280	M	ya Mopan, - Stann Cr	Yes	29/01/2018
2018	Belize	Cayo	18-007	Discarded	39011	F	k Ruin I, Spanish Look	Yes	2/02/2018
2018	Belize	Cayo	18-008	Discarded	41166	M	k Run I, Spanish Look	Yes	6/02/2018
2018	Belize	Corozal	18-009	Discarded	36880	M	North St, Wjite Cocal	Yes	29/01/2018
2018	Belize	Corozal	18-001	Discarded	42668	M	Altamira,	Yes	29/01/2018
2018	Belize	Cayo	18-013	Discarded	42656	M	George Price Highwa	Yes	3/02/2018
2018	Belize	Cayo	18-015	Discarded	42812	M	Church Street, Benqu	Yes	7/02/2018
2018	Belize	Toledo	18-019	Discarded	42982	M	Santa Elena Village,	Yes	12/02/2018
2018	Belize	Stann Creek	18-014	Discarded	42697	M	ar Street, Dangriga To	Yes	8/02/2018

Note: Do not select the table headers in the filled template file. Select only data. Always paste the data as values. When date of birth is missing, the tool will automatically use 1 January 1900, to calculate the age in months and determine eligibility to receive MMR1 vaccination.

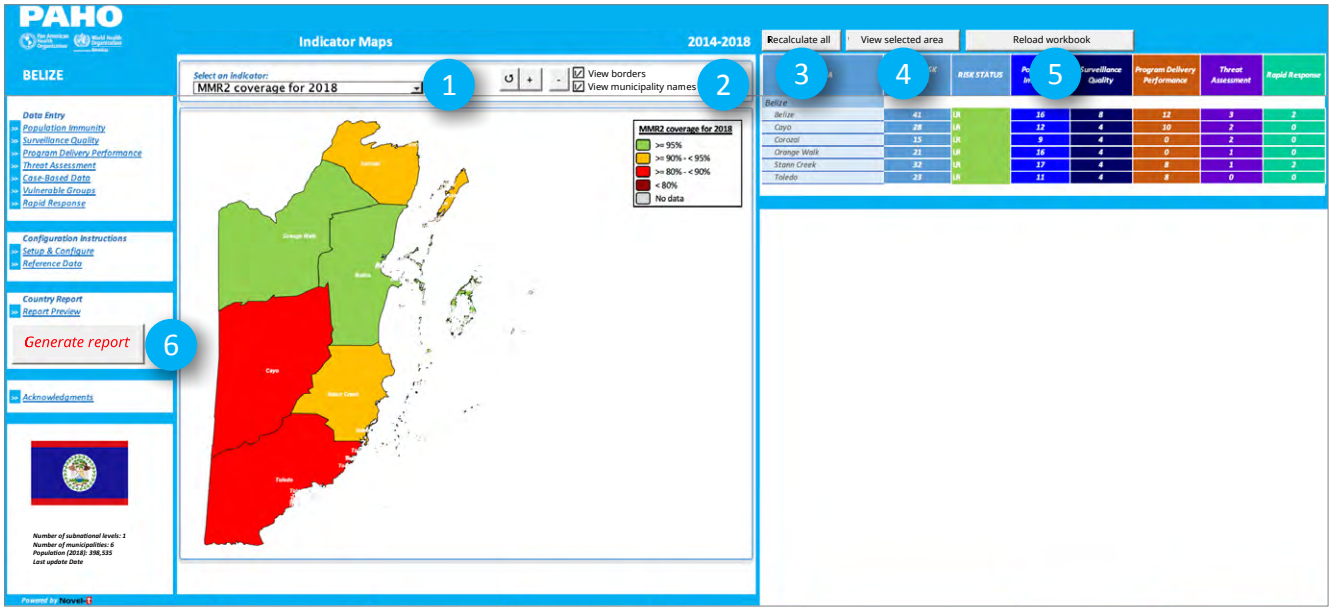
5. Case-based data are imported, and calculated columns are updated.
6. Check for any error by reviewing the calculated values (from column S to column AK).
7. When Admin1 or Admin2 names are not recognized by the tool, the cells will be empty under the Normalized_Admin2_Label column (highlighted in red). This is due to inconsistencies between the Excel template workbook and the shapefile.
   Please refer to section 2.6 Managing Alternative Names to resolve this issue.
   You can also manually change the name in the tool, though is not the best option.

Normalized_Admin2_Label	Suspected_Case	Core_Variables_Ok	Calc_Age_Months	MMR_Age_Eligible	Unvaccinated_Case	Unknown_Case	Unvac_Or_Unknown_Case
	0	1	307	1	0	1	1
	0	1	5	0	0	0	0
	0	1	273	1	0	1	1
	0	1	19	1	1	0	1
	0	1	139	1	0	0	0
	0	1	109	1	0	0	0
	0	1	414	1	0	1	1
Belize->Stann Creek	1	1	60	1	1	0	1
	0	1	135	1	0	0	0
	0	1	64	1	0	1	1
	0	1	205	1	0	1	1
	0	1	15	1	0	0	0
	0	1	15	1	0	0	0
	0	1	10	0	0	0	0
Belize->Toledo	1	1	5	0	0	0	0
Belize->Stann Creek	1	1	14	1	0	0	0
Belize->Stann Creek	1	1	10	0	0	0	0
Belize->Toledo	1	1	5	0	0	0	0
	0	1	21	1	0	0	0
	0	1	6	0	0	0	0
	0	1	13	1	0	1	1

Note: Do not edit the calculated columns that are highlighted in red. Any edits to the cased-based data should be done in the "Case-Based Data" sheet of the Excel template workbook.

4 ASSESSMENT RESULTS

The following figure shows the “Indicator Maps” sheet and its main functions, which allow the user to view the results.



Functions:

1. The list of the available indicator maps. Please see section 4.1 for more details.
2. Reload map, zoom-in/zoom-out map, hide/display the borders, and view municipality names.
3. Recalculate All: this will recalculate all the functions used to update the values and the risk scores.
4. View details of the selected area. Please see section 4.2 for more details.
5. Reload Workbook: this will reset and refresh the data.
6. Generate the report (automatically).

4.1 | VIEW INDICATOR MAPS

Once the required data are completely imported, the results of the risk assessment can be viewed by selecting one of the following indicator maps shown in the tables below (the class break for risk scoring is for both the non-outbreak and outbreak versions of the tool):

Indicator map name	**Overall Measles and Rubella Risk Profile**	
Description	This map shows the assigned overall risk for each Admin2.	
Class break for risk scoring	Total Risk Points > 75 → VHR (Very High Risk):	Dark red
	Total Risk Points > 50 and ≤ 75 → HR (High Risk):	Red
	Total Risk Points > 25 and ≤ 50 → MR (Medium Risk):	Amber
	Total Risk Points ≤ 25 → LR (Low Risk):	Green

Indicator map name	**Population Immunity**	
Description	This map shows the assigned Population Immunity risk category for each Admin2.	
Class break for risk scoring	Total Risk Points > 30 → VHR (Very High Risk):	Dark red
	Total Risk Points > 21 and ≤ 30 → HR (High Risk):	Red
	Total Risk Points > 11 and ≤ 21 → MR (Medium Risk):	Amber
	Total Risk Points ≤ 11 → LR (Low Risk):	Green

Indicator map name	**Surveillance Quality**	
Description	This map shows the assigned Surveillance Quality risk category for each Admin2.	
Class break for risk scoring	Total Risk Points > 15 → VHR (Very High Risk):	Dark red
	Total Risk Points > 11 and ≤ 15 → HR (High Risk):	Red
	Total Risk Points > 6 and ≤ 11 → MR (Medium Risk):	Amber
	Total Risk Points ≤ 6 → LR (Low Risk):	Green

Indicator map name	**Program Delivery Performance**	
Description	This map shows the assigned Program Delivery Performance risk category for each Admin2.	
Class break for risk scoring	Total Risk Points > 12 → VHR (Very High Risk):	Dark red
	Total Risk Points > 9 and ≤ 12 → HR (High Risk):	Red
	Total Risk Points > 5 and ≤ 9 → MR (Medium Risk):	Amber
	Total Risk Points ≤ 5 → LR (Low Risk):	Green

Indicator map name	**Threat Assessment**	
Description	This map shows the assigned Threat Assessment risk category for each Admin2.	
Class break for risk scoring: non outbreak	Total Risk Points > 9 → VHR (Very High Risk):	Dark red
	Total Risk Points > 7 and ≤ 9 → HR (High Risk):	Red
	Total Risk Points > 4 and ≤ 7 → MR (Medium Risk):	Amber
	Total Risk Points ≤ 4 → LR (Low Risk):	Green
Class break for risk scoring: outbreak	Total Risk Points > 14 → VHR (Very High Risk):	Dark red
	Total Risk Points > 10 and ≤ 14 → HR (High Risk):	Red
	Total Risk Points > 5 and ≤ 10 → MR (Medium Risk):	Amber
	Total Risk Points ≤ 5 → LR (Low Risk):	Green

Indicator map name	**Rapid Response**	
Description	This map shows the assigned Rapid Response risk category for each Admin2.	
Class break for risk scoring: non outbreak	Total Risk Points > 9 → VHR (Very High Risk): Dark Red	Dark red
	Total Risk Points > 7 and ≤ 9 → HR (High Risk): Red	Red
	Total Risk Points > 4 and ≤ 7 → MR (Medium Risk): Amber	Amber
	Total Risk Points ≤ 4 → LR (Low Risk): Green	Green
Class break for risk scoring: outbreak	Total Risk Points > 6 → VHR (Very High Risk): Dark Red	Dark red
	Total Risk Points > 4 and ≤ 6 → HR (High Risk): Red	Red
	Total Risk Points > 2 and ≤ 4 → MR (Medium Risk): Amber	Amber
	Total Risk Points ≤ 2 → LR (Low Risk): Green	Green

Indicator map name	**Risk Scores for Very High Risk Municipalities**	
Description	This map shows Admin2 areas (municipalities) with **Very High Risk.**	
Class break for risk assessment	Total Risk Points > 75 → VHR (Very High Risk):	Dark red

Indicator map name	**Risk Scores for High Risk Municipalities**	
Description	This map shows Admin2 areas (municipalities) with **High Risk.**	
Class break for risk assessment	Total Risk Points > 50 and ≤ 75 → HR (High Risk):	Red

Indicator map name	**Risk Scores for Medium Risk Municipalities**	
Description	This map shows Admin2 areas (municipalities) with **Medium Risk.**	
Class break for risk assessment	Total Risk Points > 25 and ≤ 50 → MR (Medium Risk):	Amber

Indicator map name	**Risk Scores for Low-Risk Municipalities**	
Description	This map shows Admin2 areas (municipalities) with **Low Risk.**	
Class break for risk assessment	Total Risk Points ≤ 25 → LR (Low Risk):	Green

Indicator map name	**MMR1 Coverage for <Reference Year – X> (With X = 5, 4, 3, 2, 1)**	
Description	This map shows the MMR1 coverage for the <Reference year – X>, distributed by coverage range.	
Class break for risk assessment	Coverage < 80%:	Dark red
	Coverage ≥ 80% and < 90%:	Red
	Coverage ≥ 90% and < 95%:	Amber
	Coverage ≥ 95%:	Green

Indicator map name	**MMR2 Coverage for <Reference Year – X> (With X = 5, 4, 3, 2, 1)**	
Description	This map shows the MMR2 coverage for the <Reference year – X>, distributed by coverage range.	
Class break for risk assessment	Coverage < 80%:	Dark red
	Coverage ≥ 80% and < 90%:	Red
	Coverage ≥ 90% and < 95%:	Amber
	Coverage ≥ 95%:	Green

Indicator map name	**Coverage of Measles and Rubella Follow-up Campaign**	
Description	This map shows the coverage of the last follow-up campaign conducted in the country, distributed by coverage range.	
Class break for risk assessment	Coverage < 80%:	Dark red
	Coverage ≥ 80% and < 90%:	Red
	Coverage ≥ 90% and < 95%:	Amber
	Coverage ≥ 95%:	Green

Indicator map name	**Notification Rate of Suspected Cases**	
Description	This map shows the annual notification rate of suspected measles and rubella cases for each Admin2.	
Class break for risk assessment	Municipalities with more than 100,000 pop. and have reported 0 cases:	Red
	Municipalities with more than 100,000 pop. and have reported 1 case:	Amber
	Municipalities with more than 100,000 pop. and have reported 2 cases or more:	Green
	Municipalities with less than 100,000 pop. and have reported 0 cases:	Red
	Municipalities with less than 100,000 pop. and have reported 1 case or more:	Green

Indicator map name	**Measles and/or Rubella Cases in the Past Year**	
Description	This map shows Admin2 (municipalities) with confirmed cases of measles or rubella.	
Class break for risk assessment	Municipalities with 1 case or more:	Red
	Municipalities with no confirmed cases:	Green

Indicator map name	**Percentage of Cases with Adequate Investigation**	
Description	This map shows the percentage of cases with adequate investigation using the minimum threshold of 80% as a risk cut-off.	
Class break for risk assessment	With adequate investigation < 80%:	Red
	With adequate investigation ≥ 80%:	Green

Indicator map name	**Percentage of Cases with Adequate Specimen Collection**	
Description	This map shows the percentage of cases with adequate specimen collection using the minimum threshold of 80% as a risk cut-off	
Class break for risk assessment	With adequate specimen collection < 80%:	Red
	With adequate specimen collection ≥ 80%:	Green

Indicator map name	**Percentage of Blood Specimens Received in the Laboratory in ≤ 5 days**	
Description	This map shows the percentage of blood samples received in the laboratory in 5 days or less, using the minimum threshold of 80% as a risk cut-off.	
Class break for risk assessment	Percentage of blood samples received in the laboratory in 5 days or less < 80%:	Red
	Percentage of blood samples received in the laboratory in 5 days or less ≥ 80%:	Green

Indicator map name	**MMR1 Trend**	
Description	This map shows the MMR1 trend across the last 5 years. Please refer to Annex 2 to know how the risk was calculated for this indicator.	
Class break for risk assessment	Trend < –10%	Red
	Trend ≥ –10% and < 0%	Amber
	Trend ≥ 0%	Green

Indicator map name	**MMR2 Trend**	
Description	This map shows the MMR1 trend across the last 5 years. Please refer to Annex 2 to know how the risk was calculated for this indicator.	
Class break for risk assessment	Trend < –10%	Red
	Trend ≥ –10% and < 0%	Amber
	Trend ≥ 0%	Green

Indicator map name	**Drop-out Rate MMR1-MMR2**	
Description	This map shows the drop-out rate between MMR1 and MMR2, using the minimum threshold of 5% as a cut-off risk.	
Class break for risk assessment	Drop-out rate ≥ 5%:	Red
	Drop-out rate < 5%:	Green

Indicator map name	**Drop-out Rate Penta1-MMR1**	
Description	This map shows the drop-out rate between Penta1 and MMR1, using the minimum threshold of 5% as a cut-off risk.	
Class break for risk assessment	Drop-out rate ≥ 5%:	Red
	Drop-out rate < 5%:	Green

Indicator map name	**Population Density**	
Description	This map shows the population density for municipalities. Please refer to Annex 2 to know how the risk was calculated for this indicator.	
Class break for risk assessment	Total risk points > 3 (density between density threshold 3 and threshold 4):	Dark red
	Total risk points >2 and ≤3 (density between density threshold 2 and threshold 3):	Red
	Total risk points >1 and ≤2 (density between density threshold 1 and threshold 2):	Amber
	Total risk points = 1 (density < density threshold 1):	Green
	With: density threshold 1 = [Median Population Density]/2 density threshold 2 = [Median Population Density] density threshold 3 = ([Median Population Density]/2)*3	

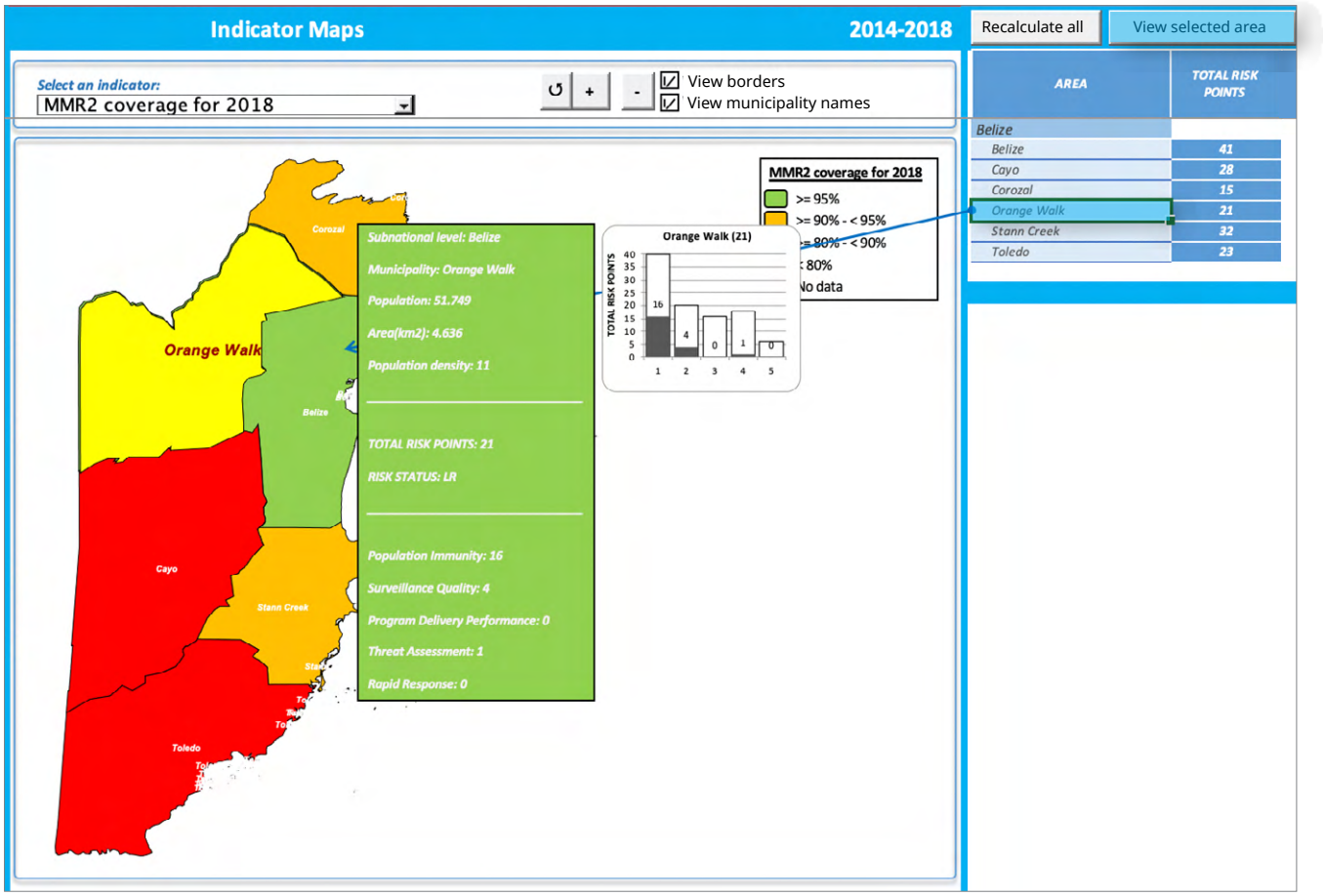
Indicator map name	**Presence of Vulnerable Population**	
Description	This map shows the presence of vulnerable population in each Admin2 (municipality) based on the responses to 8 questions.	
Class break for risk assessment	Total "Yes" answers > 6 → VHR (Very High Risk):	Dark red
	Total "Yes" answers >4 and ≤ 6 → HR (High Risk):	Red
	Total "Yes" answers >2 and ≤ 4 → MR (Medium Risk):	Amber
	Total "Yes" answers ≤ 2 → LR (Low Risk):	Green

Indicator map name	**Presence of Rapid Response Team**	
Description	This map shows the presence of a trained Rapid Response Team at the subnational level where the Admin2 is located.	
Class break for risk assessment	If no rapid response team is present → HR (High Risk):	Red
	If a rapid response team is present → LR (Low Risk):	Green

Indicator map name	**Percentage of Hospitals with Staff Trained in Triage and Isolation**	
Description	This map shows the percentage of hospitals with staff trained in triage and isolation at the subnational level where the Admin2 is located, by range.	
Class break for risk assessment	% of hospitals with staff trained in triage and isolation ≥ 80%:	Green
	% of hospitals with staff trained in triage and isolation ≥ 50% and < 80%:	Amber
	% of hospitals with staff trained in triage and isolation < 50%:	Red

4.2 | VIEW AREA DETAILS

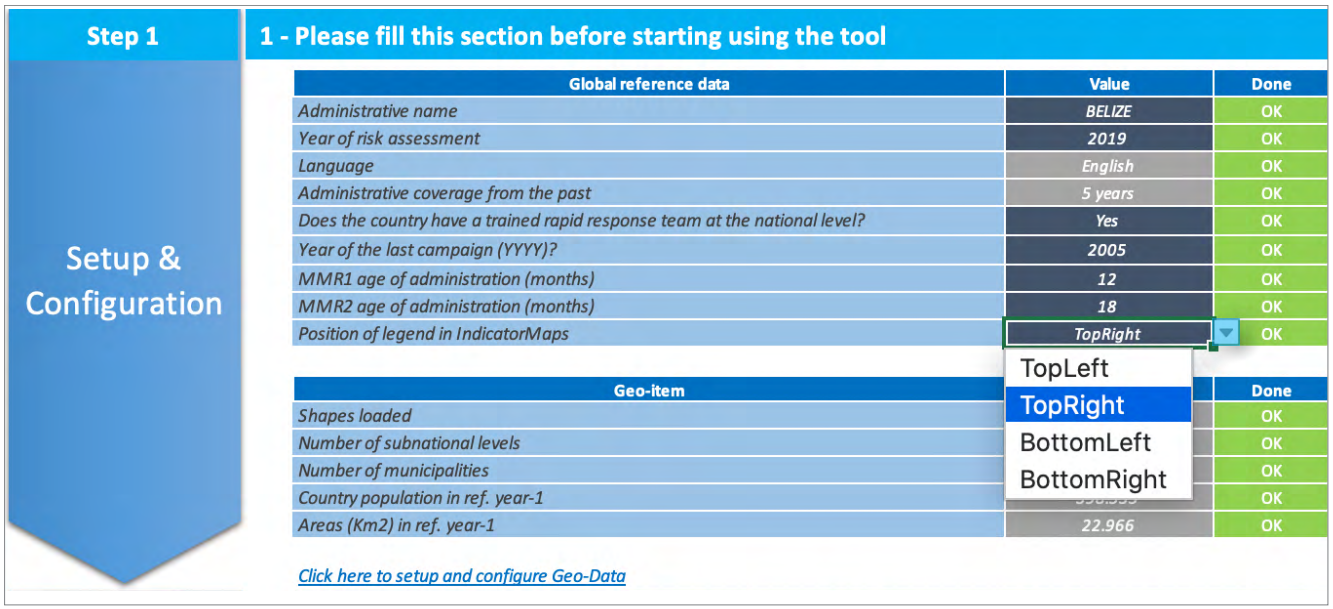
To view details for a given area, click its shape or select an Admin2 name (municipality) in the area column and click the “View Selected Area” button. You will have access to a descriptive risk assessment at the municipality level following the five categories.



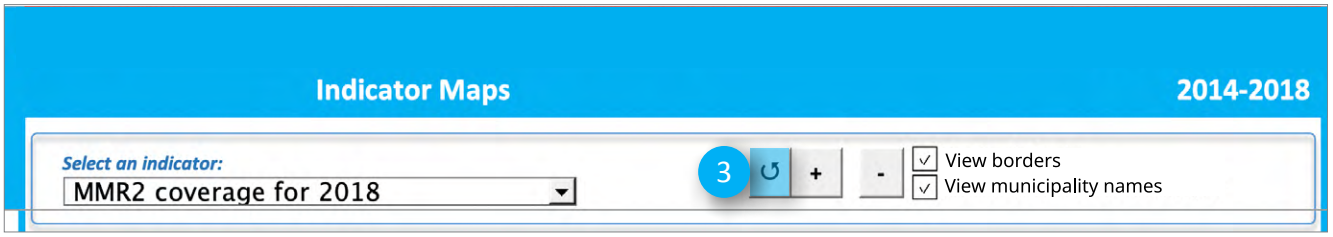
4.3 | CHANGE THE LEGEND POSITION

The legend is displayed in the top left corner of the map by default. However, if the legend is overlapping part of the map, then it is possible to change its position as follows:

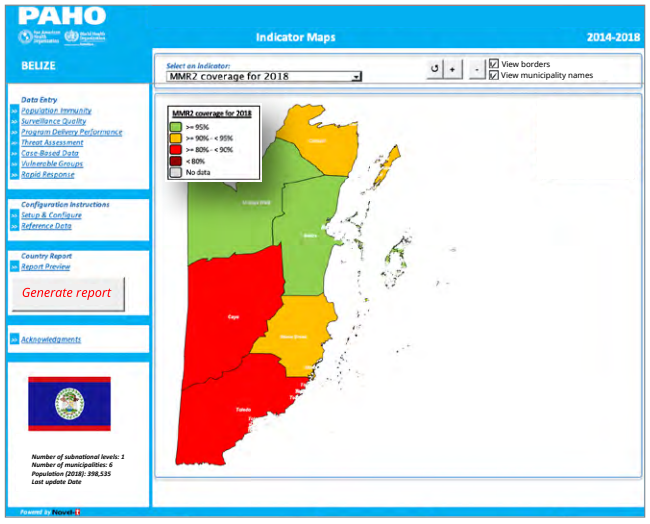
1. Select the “Setup & Configuration” worksheet.
2. In the “Position of legend in IndicatorMaps” drop-down list, select one of the other suggested positions.

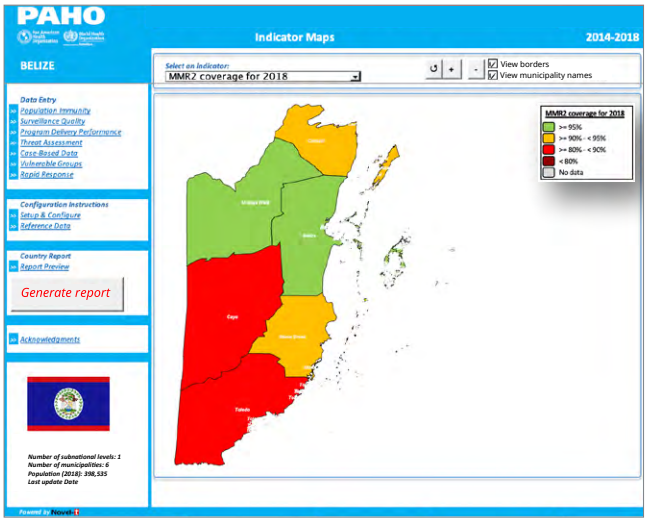


3. Select the “Indicator Maps” worksheet and click the refresh map button or choose another map.



This is the result:



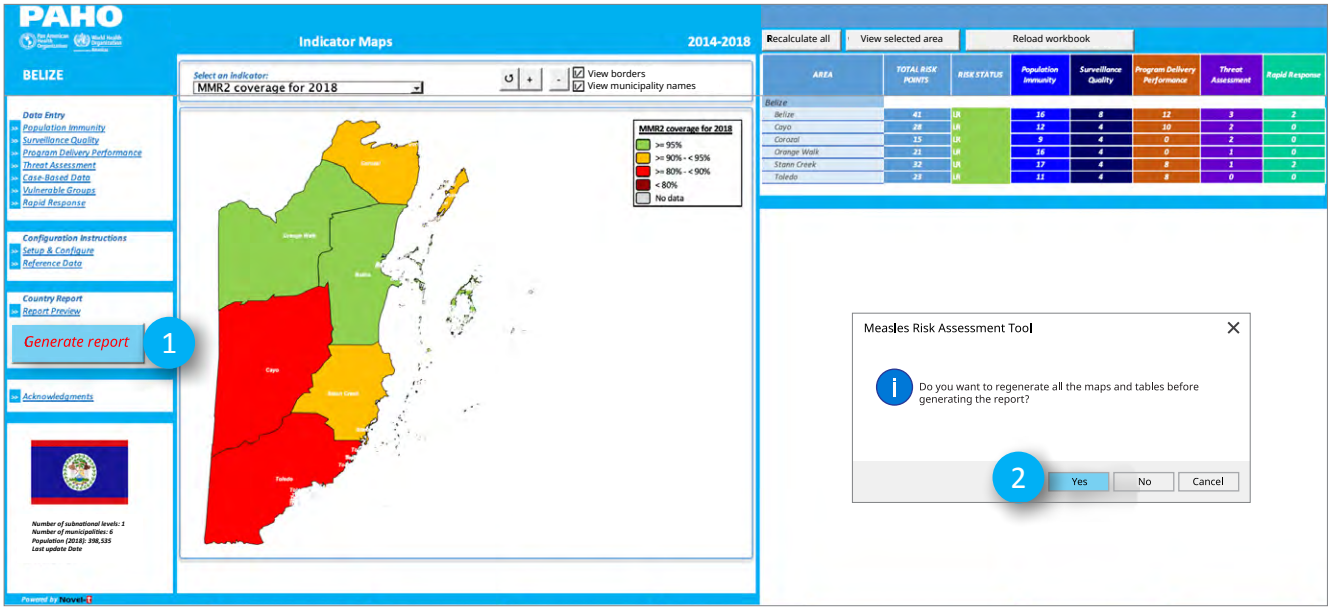


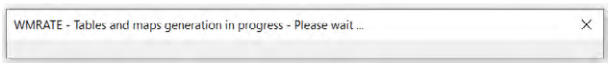
5 GENERATE THE REPORT

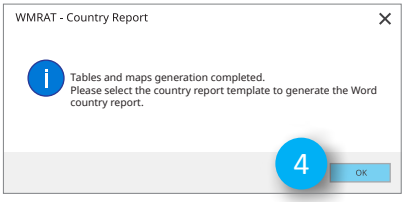
After reviewing the result of the assessed risk, a country report can be generated based on a predefined Word template document, following the language chosen to initially configure the tool (English, French, Portuguese, or Spanish). You can have a preview of the report in the tab called Report Preview.

To generate the country report, perform the following actions:

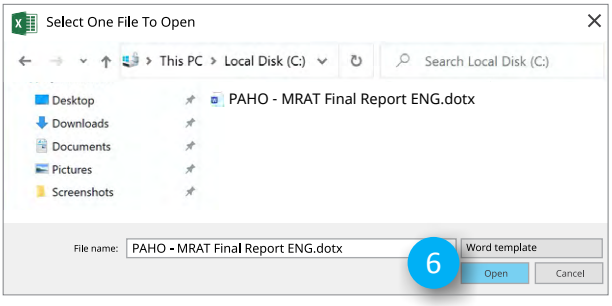
1. In the “Indicator Maps” sheet, click the “Generate Report” button.
2. Click the “Yes” button to generate all maps and data tables. This process may take a few minutes, depending on the number of municipalities to assess.
3. A message will be displayed once the generation is completed.
4. Click “OK”.



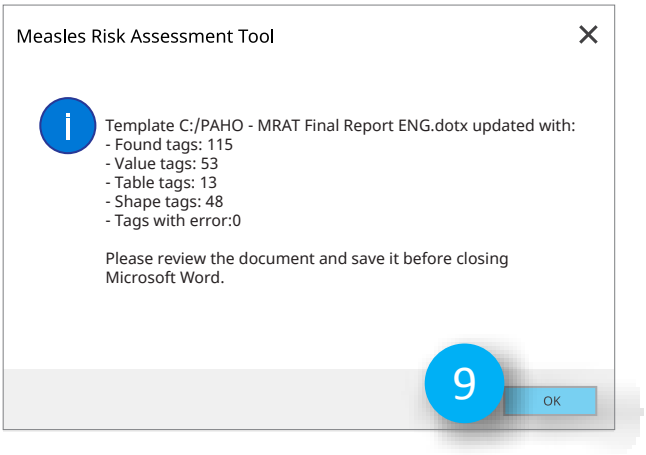




5. Browse and locate the country report templates.
6. Select the country report template to use and click the “Open” button.
7. The country report will be generated as a Word document.



8. Switch back to the tool; a message will be displayed showing the following:
   The country report template used;
   The number of merged tags;
   The number of errors.
9. Click “OK” to close the message box.
10. Review the generated country report, which can be edited and amended. Save the file to your local drive before you proceed with edits.



GLOSSARY

Discarded case. A suspected case with adequate investigation and discarded when any of the following are true:

- Negative laboratory testing in a proficient laboratory on an adequate specimen collected during the proper time period after rash onset;
- Epidemiological linkage to a laboratory-confirmed outbreak of another communicable disease that is not measles or rubella;
- Confirmation of another etiology;
- Failure to meet the clinical measles and rubella case definitions;
- The case was discarded by the National Sustainability Committee after reviewing the clinical and epidemiological evidence.

Drop-out rate. It refers to the percentage of vaccination recipients (i.e., children) who begin their schedules but do not complete them. It can be calculated by comparing the number of children vaccinated with Penta1/DPT1 and BCG, Penta3/DPT3 and Penta1/DPT1, or MMR1 and Penta1/DPT1.

Follow-up campaign. A mass and indiscriminate vaccination campaign targeting preschool-age children (aged 1–4 years) or when the number of susceptible individuals to measles approaches the size of an average birth cohort for that year. Measles-rubella (MR) or measles-mumps-rubella (MMR) vaccines are used in this type of campaign.

GeoJSON. A geospatial data interchange format, designed as an open standard format for representing simple geographical features along with their non-spatial attributes.

Measles. In the tool, measles refers to a case confirmed by one of the following means: positive laboratory result; epidemiologically linked to a laboratory-confirmed case; or clinically compatible with measles.

Not eligible. Individuals who are not eligible to be vaccinated against measles and rubella either due to their age (less than 12 months) or because there are contraindications to having the vaccine (e.g., pregnant women). However, in countries implementing the "zero dose" policy, infants aged 6–11 months will be eligible to receive measles-rubella-containing vaccine.

Rubella. In the tool, rubella refers to a case confirmed by one of the following means: positive laboratory result; epidemiologically linked to a laboratory-confirmed case; or clinically compatible with rubella.

Shapefile. A geospatial vector data format for geographic information system software. It can be represented by points, lines, or polygons (areas).

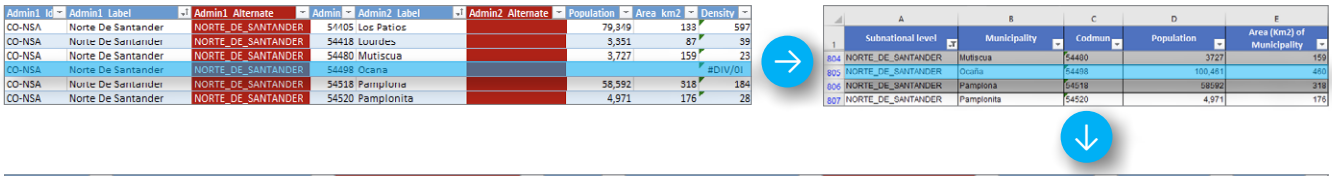
Silent municipality. This refers to an area that has not reported any suspected case of measles or rubella during a calendar year, regardless of its population size.

Subnational level. This refers to the second administrative level in any given country, using the terminology of state, province, region, department, or equivalent level.

ANNEX 1 | COMMON ISSUES AND TROUBLESHOOTING

Issue 1: Some of the data are not imported due to issues with the names for Admin1 or Admin2

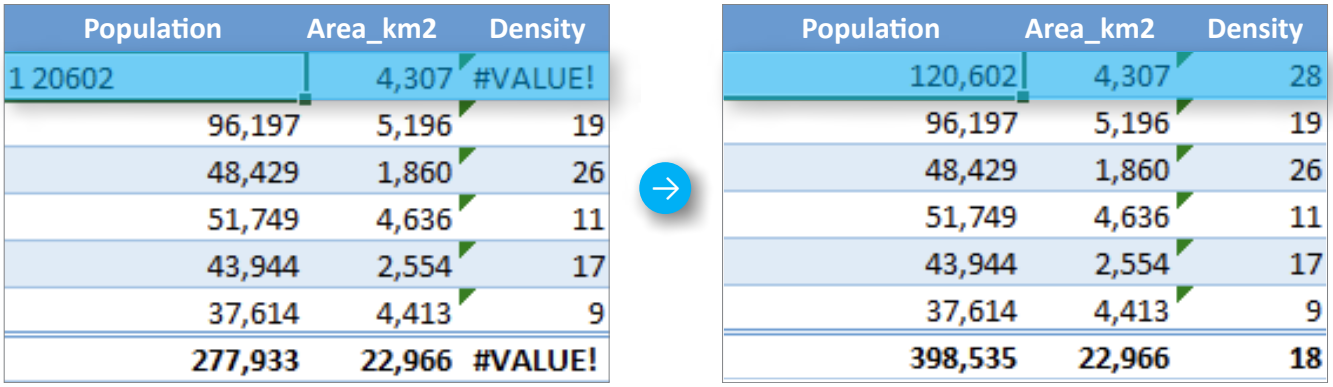
- ➔ Compare Admin1 and Admin2 between the tool and the template.
- ➔ Set alternate names for Admin1 and Admin2 and import the data again.
- ➔ Make sure to copy the name as text and not as a cell.



Admin1_Id	Admin1_Label	Admin1_Alternate	Admin	Admin2_Label	Admin2_Alternate	Population	Area_km2	Density
CO-NSA	Norte De Santander	NORTE_DE_SANTANDER	54405	Los Patios		79,349	133	597
CO-NSA	Norte De Santander	NORTE_DE_SANTANDER	54418	Lourdes		3,351	87	39
CO-NSA	Norte De Santander	NORTE_DE_SANTANDER	54480	Mutiscua		3,727	159	23
CO-NSA	Norte De Santander	NORTE_DE_SANTANDER	54498	Ocana	Ocaña	100,461	460	218
CO-NSA	Norte De Santander	NORTE_DE_SANTANDER	54518	Pamplona		58,592	318	184
CO-NSA	Norte De Santander	NORTE_DE_SANTANDER	54520	Pamplonita		4,971	176	28

Issue 2: Incorrect number format

- ➔ Make sure to use numbers instead of text, which appears left aligned in the cell.

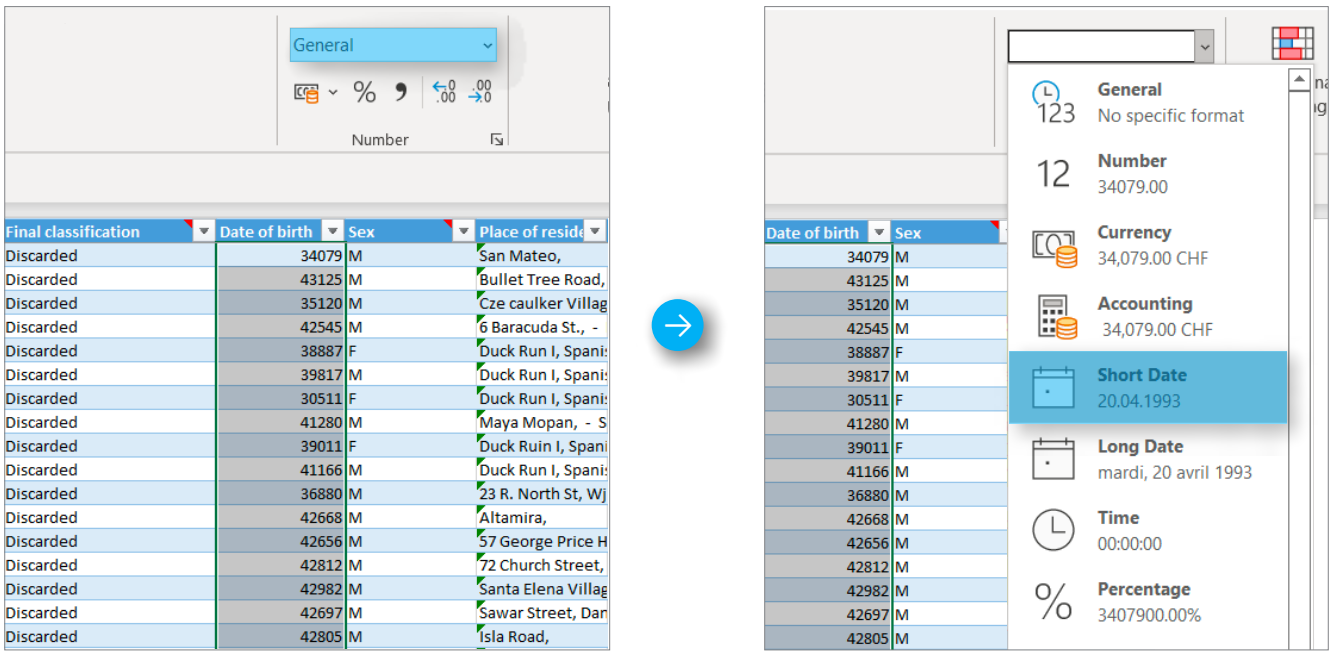


Population	Area_km2	Density
1 20602	4,307	#VALUE!
96,197	5,196	19
48,429	1,860	26
51,749	4,636	11
43,944	2,554	17
37,614	4,413	9
277,933	22,966	#VALUE!

Population	Area_km2	Density
120,602	4,307	28
96,197	5,196	19
48,429	1,860	26
51,749	4,636	11
43,944	2,554	17
37,614	4,413	9
398,535	22,966	18

Issue 3: Incorrect date format in the case-based data

- ➔ Make sure to apply Excel “Date” format.

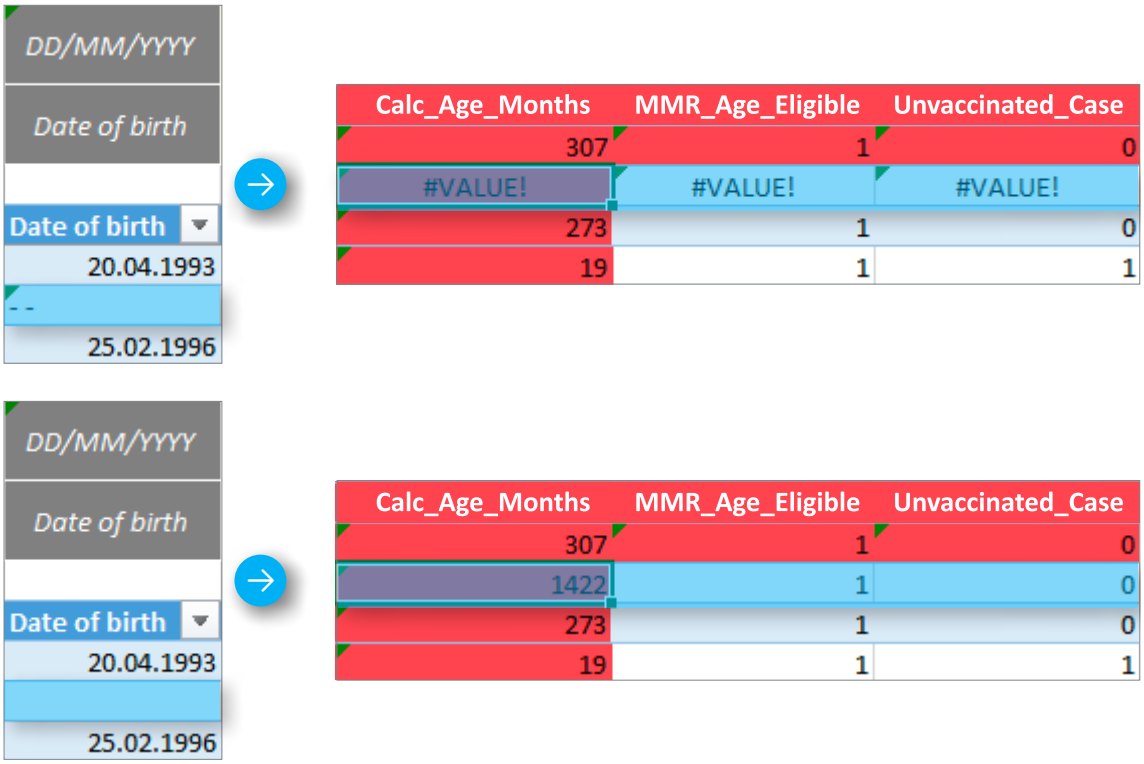


Final classification	Date of birth	Sex	Place of reside
Discarded	34079	M	San Mateo,
Discarded	43125	M	Bullet Tree Road,
Discarded	35120	M	Cze caulker Villag
Discarded	42545	M	6 Baracuda St., -
Discarded	38887	F	Duck Run I, Spani
Discarded	39817	M	Duck Run I, Spani
Discarded	30511	F	Duck Run I, Spani
Discarded	41280	M	Maya Mopan, - S
Discarded	39011	F	Duck Ruin I, Spani
Discarded	41166	M	Duck Run I, Spani
Discarded	36880	M	23 R. North St, Wj
Discarded	42668	M	Altamira,
Discarded	42656	M	57 George Price H
Discarded	42812	M	72 Church Street,
Discarded	42982	M	Santa Elena Villag
Discarded	42697	M	Sawar Street, Dar
Discarded	42805	M	Isla Road,

Date of birth	Sex
34079	M
43125	M
35120	M
42545	M
38887	F
39817	M
30511	F
41280	M
39011	F
41166	M
36880	M
42668	M
42656	M
42812	M
42982	M
42697	M
42805	M

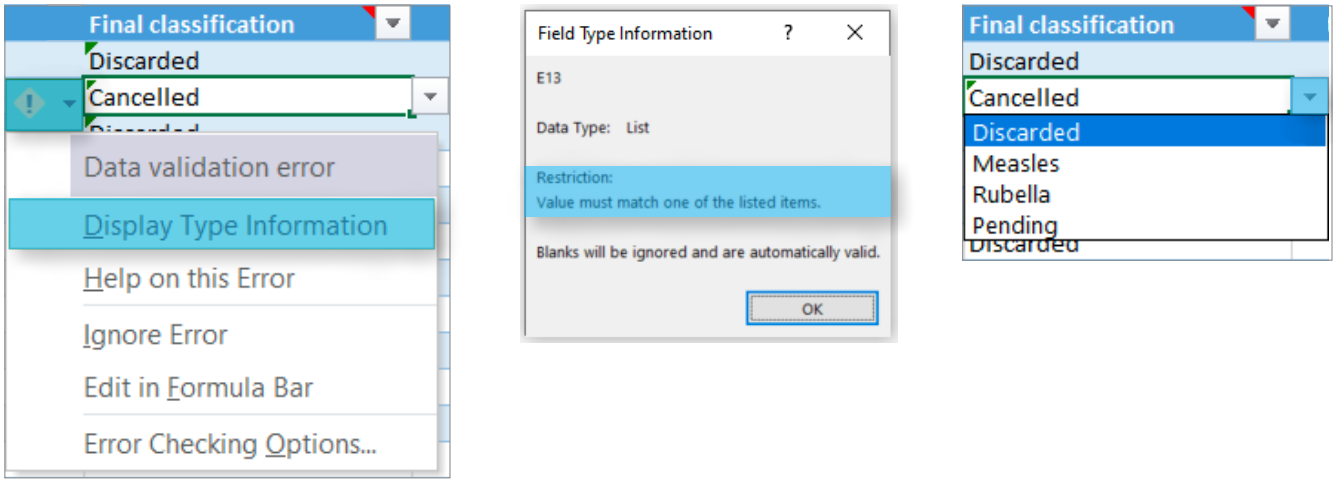
Issue 4: Incorrect date format in the case-based data

➔ Make sure to leave missing dates as empty cells. Do not include any characters in date columns.



Issue 5: Unknown predefined values

➔ Make sure to use the predefined values.

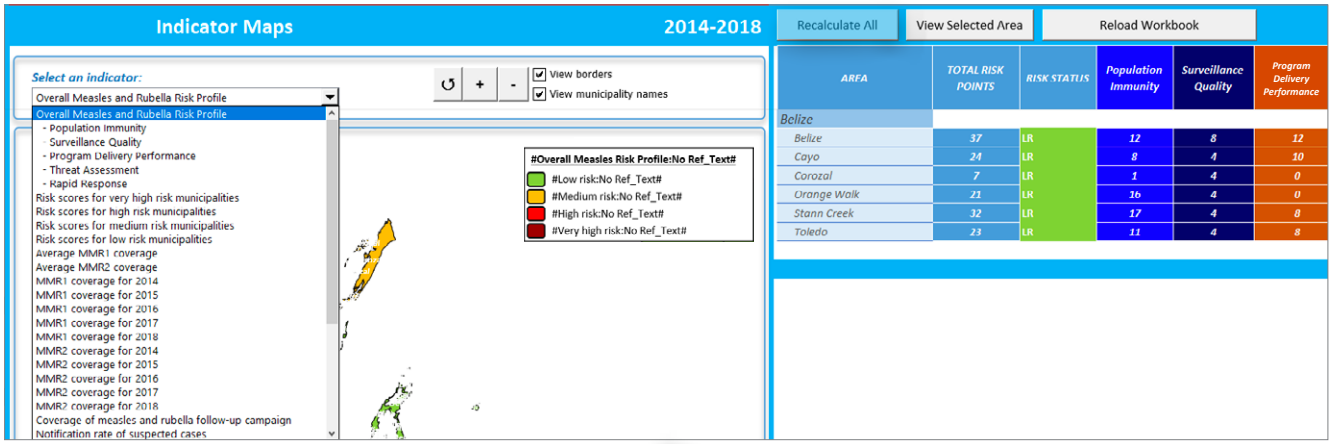


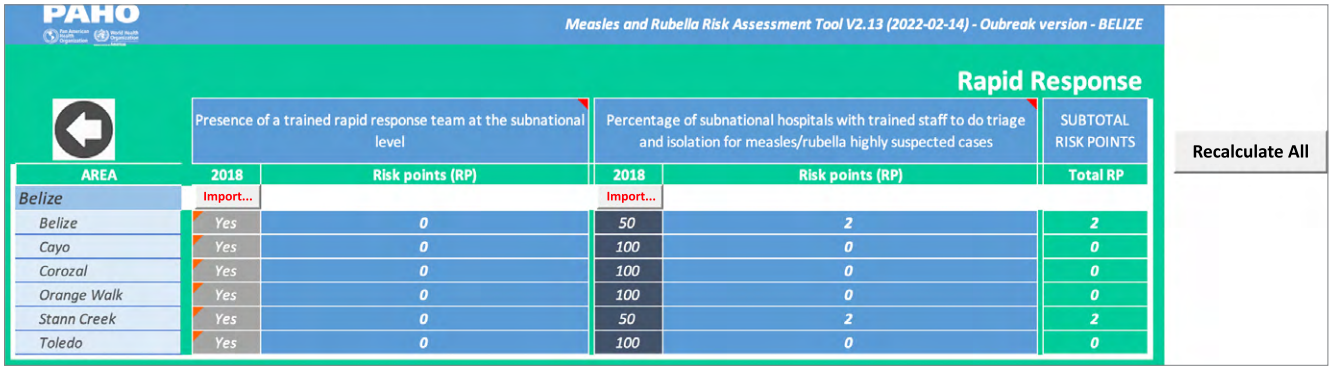
Issue 6: Indicator maps dropdown list not fully filled or not fully translated

- ➔ Click the “Recalculate All” button then “Reload Workbook”.
- ➔ Or save your workbook, close it, and then open it again.

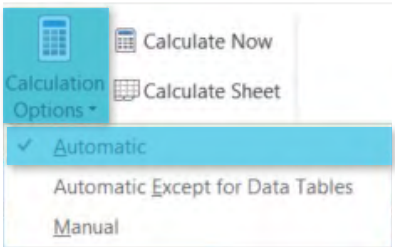
Issue 7: Formulas not refreshed/calculated

➔ Click the “Recalculate All” button.



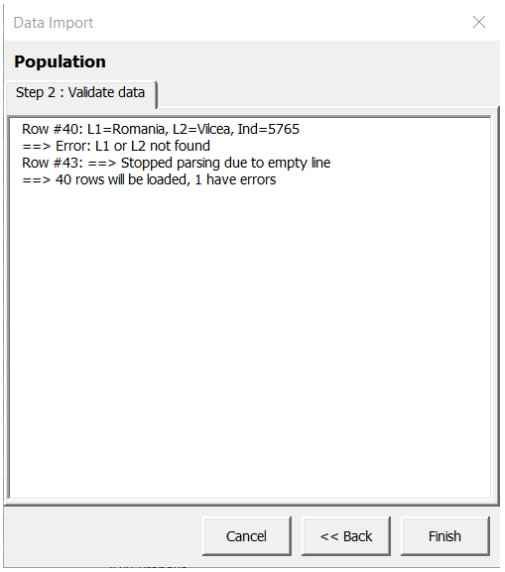


➔ Set Excel calculation mode to Automatic via the [Formulas] [Calculation Options] menu.



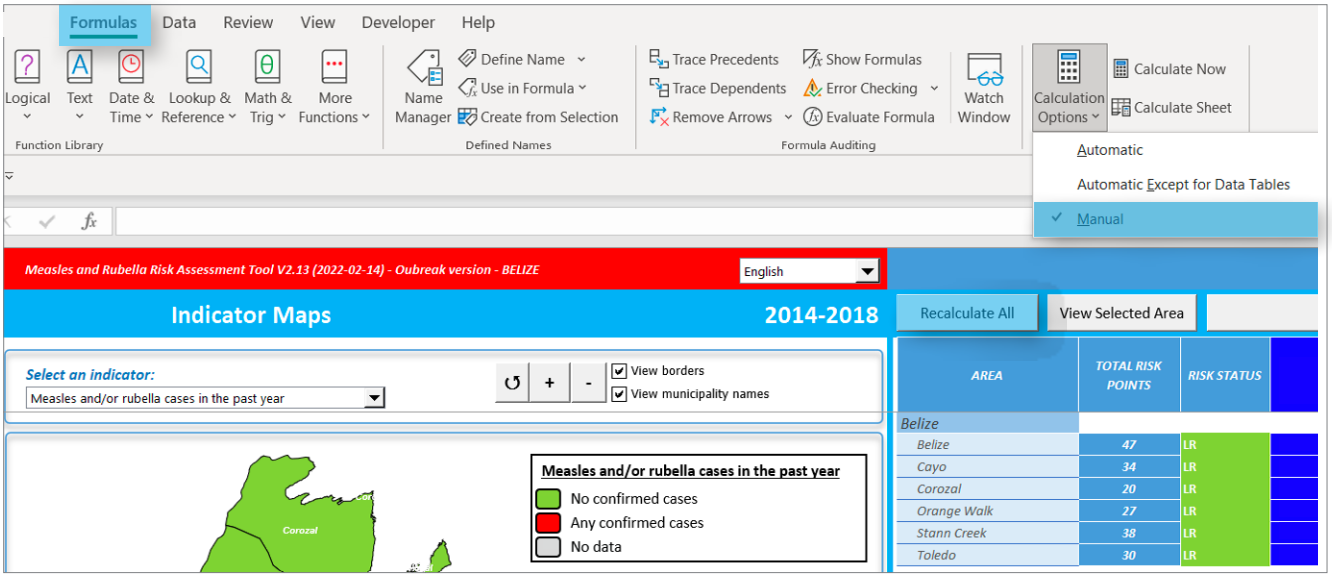
Issue/Tip 8: Verify messages for empty values

➔ Pay attention to tool messages when loading data for errors or missing data; correct them and reload the data.

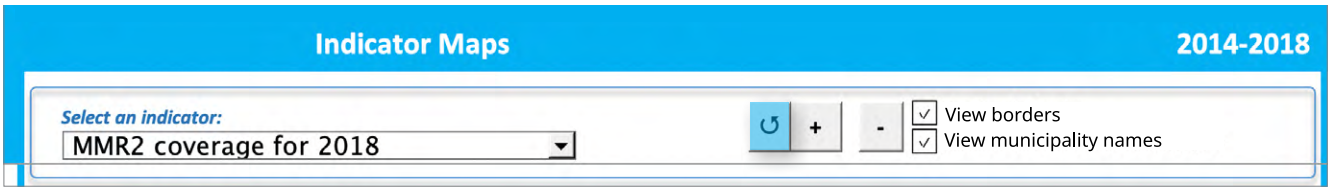


Issue/Tip 9: Set the calculation mode to Manual when dealing with a large amount of data

➔ Calculation of all formulas may take longer when the tool is run with a large amount of data. In this case, you can set the calculation mode to Manual to avoid this. Click the "Recalculate All" button to refresh the formulas prior to viewing the indicator maps and/or generating the report.

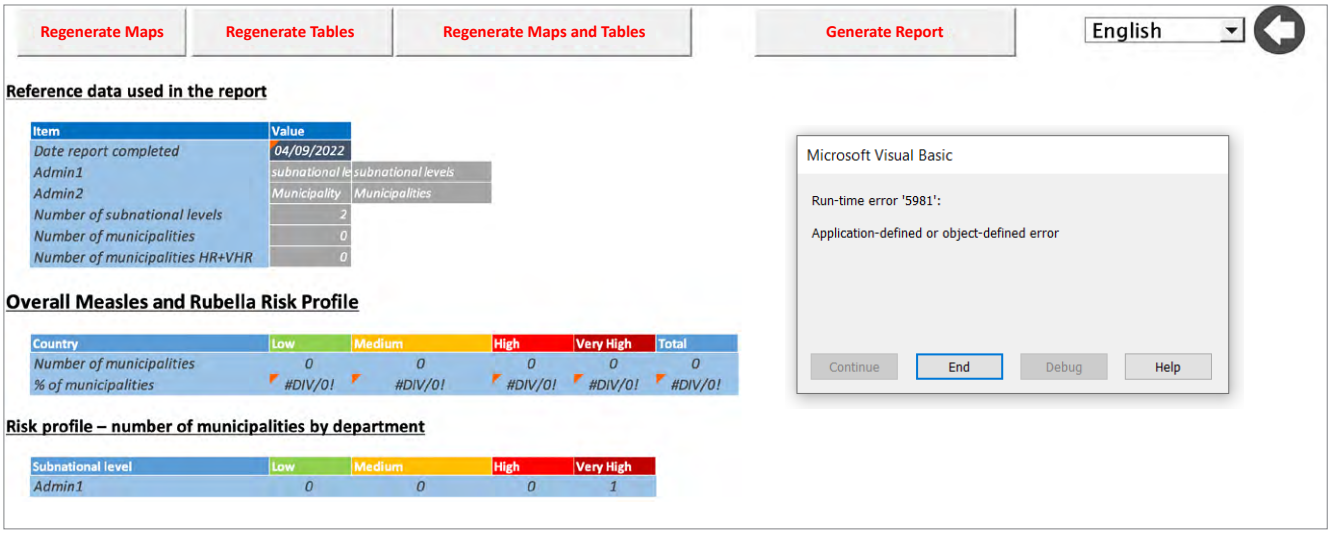


Sometimes, an Excel 400 error occurs when selecting another indicator map. In this case, you need to refresh the map by clicking the "Refresh Map" button.

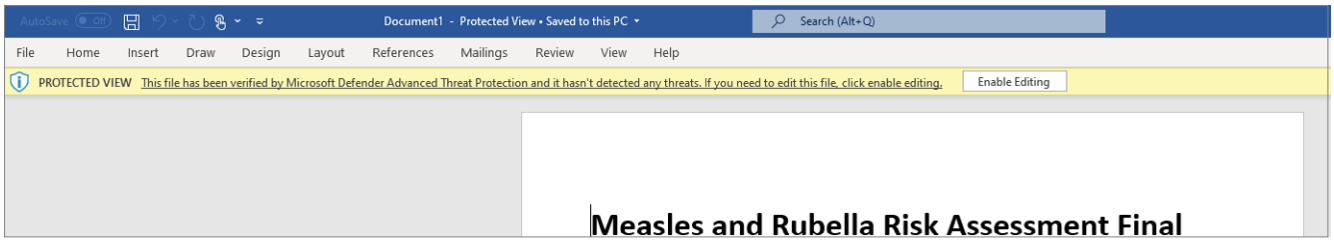


Issue/Tip 10: Error 5981 when macros are disabled

There are several causes for error 5981. Here are ways to remedy the error.



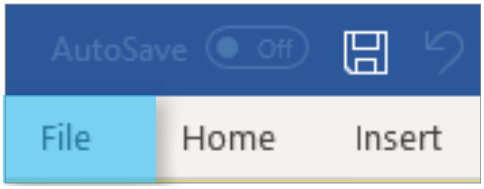
Solution 1: Enable editing of Word document



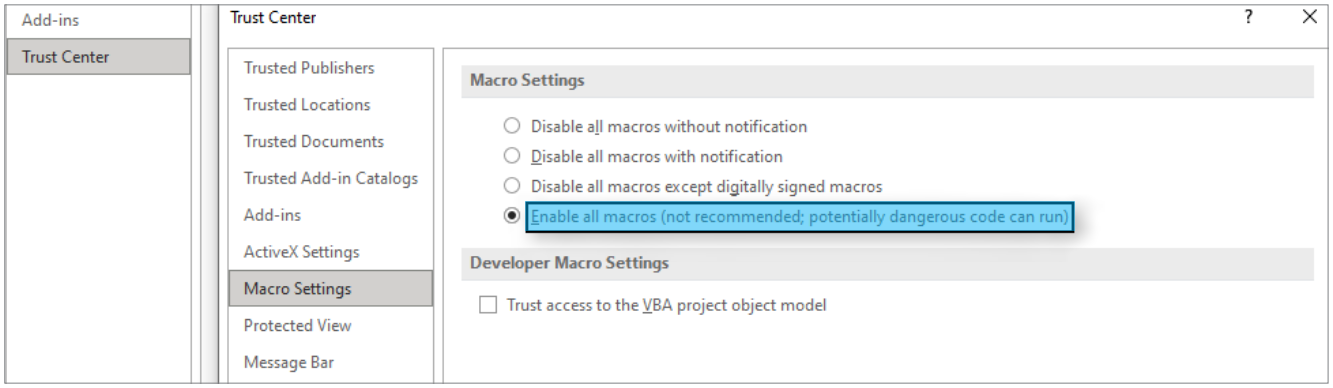
- ➔ Close the Excel documents
- ➔ Open the Word template country report
- ➔ Click on Enable Editing button located in the Protected View message
- ➔ Save the word and exit Word

Solution 2: Enable macros in Trusted Center

- ➔ Open a blank Word document

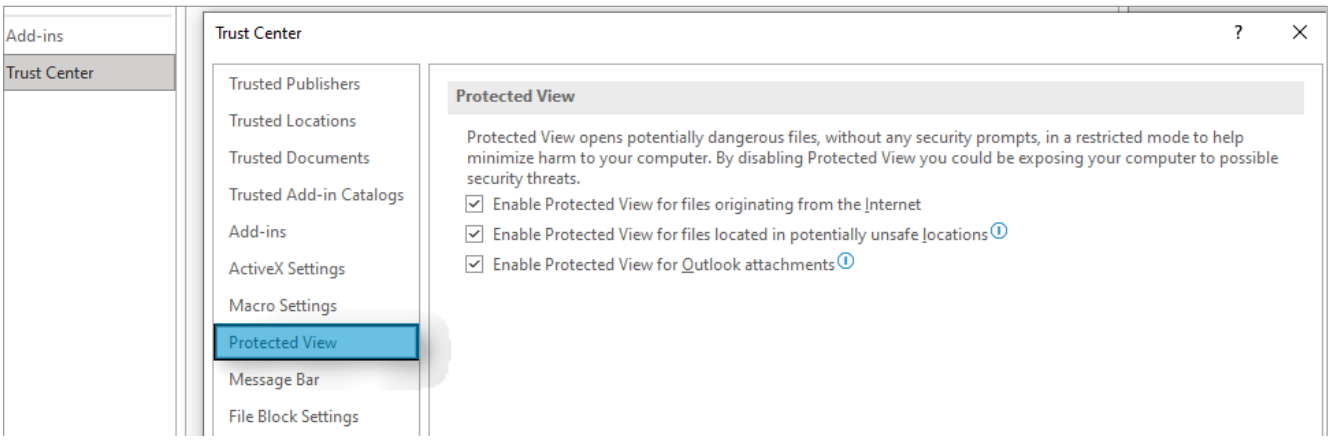


- ➔ On the bottom left click “Options”
- ➔ A pop window will open, click “Trust Center”
- ➔ Click on “Trust Center Settings”
- ➔ Click on “Macro Settings”
- ➔ Click on “Enable all Macros”
- ➔ Accept all, save and close Word document.



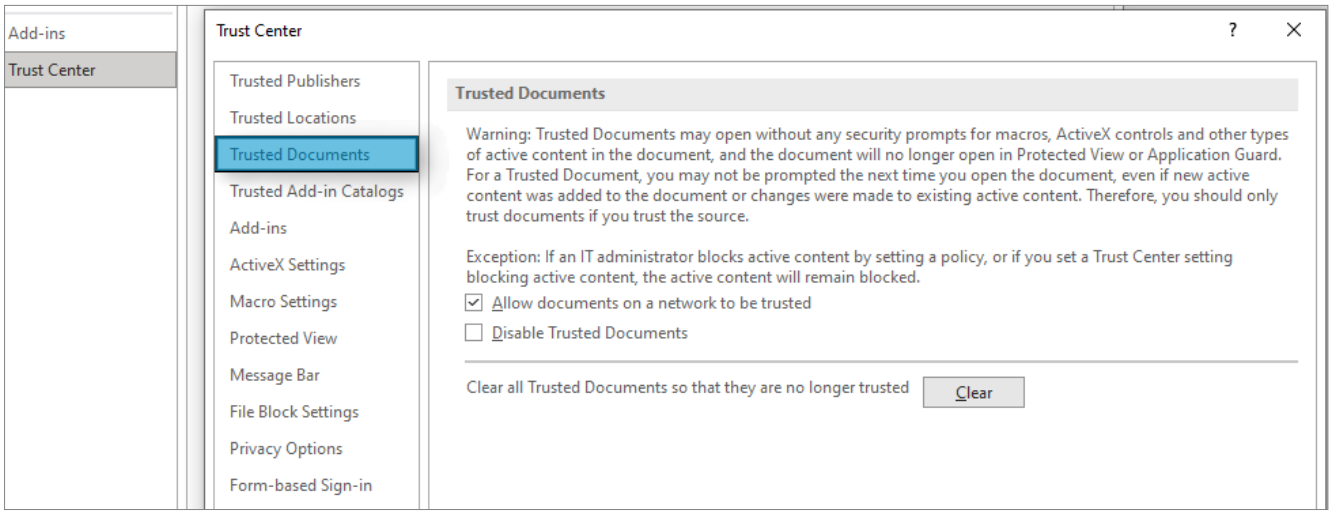
Solution 3: Disable Protect View in Trusted Center

- ➔ Click on “Protected View”
- ➔ Disable the 3 options by unchecking the check boxes
- ➔ Accept all, save and close Word document



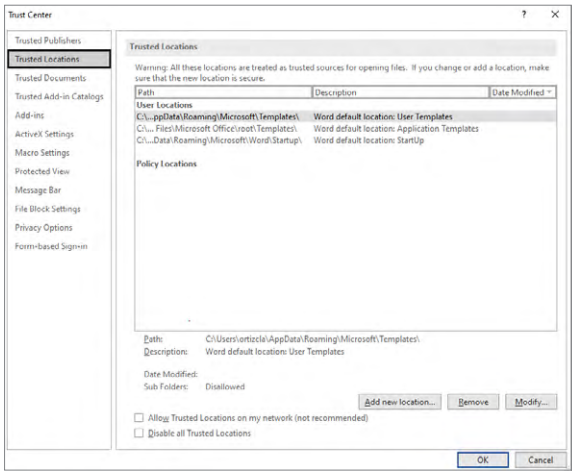
Solution 4: Allow document on a network to be trusted

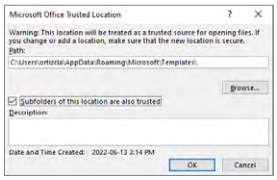
- ➔ Click on “Trusted Documents”
- ➔ Enable the “Allow documents on a network to be trusted” option
- ➔ Accept all, save and close Word document

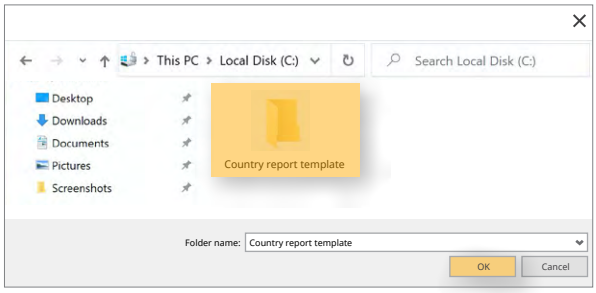


Solution 5: Enable a new location in Trusted Center

- ➔ Click on “Trusted Locations”
- ➔ Click “Add New Location”
- ➔ Enable subfolders, then click “Browse”
- ➔ Select the folder that contains the Word template country report
- ➔ Accept all, save and close Word document







ANNEX 2 | RISK ASSESSMENT CATEGORIES, VARIABLES, AND SCORING: OUTBREAK SCENARIO

Population Immunity indicators	Cut-off criteria (risk points)	How the risk is calculated	Formula
MMR1 coverage	≥95% (+0) 90%–94% (+2) 85%–89% (+4) 80%–84% (+6) <80% (+8) **Total: 8**	Calculate risk points per each coverage level [a] reported in the past five years and then obtain the average of the risk score, to assign risk point at the municipality level.	Compound formula; not presented here
Percentage of neighboring municipalities with <95% of MMR1 coverage	<25% (+0) 25%–50% (+2) 51%–75% (+4) >75% (+8) **Total: 8**	Assess representativeness of immunity gap in surrounding area of a municipality. To calculate risk points, the tool will assess if any neighboring municipality has reported coverage of <95% in the previous year.	Number of neighboring municipalities with <95% --- Total number of neighboring municipalities
MMR2 coverage	≥95% (+0) 90%–94% (+2) 85%–89% (+4) 80%–84% (+6) <80% (+8) **Total: 8**	Calculate risk points per each coverage level [a] reported in the past five years and then obtain the average of the risk score, to assign risk point at the municipality level.	Compound formula; not presented here
Coverage of last follow-up campaign	≥95% (+0) 90%–94% (+2) 85%–89% (+4) <84% (+6) No campaign (+8) **Total: 8**	Assess the administrative coverage reported from the last follow-up campaign [a] to assign risk point. If campaign is not part of national strategy, assign 0 risk points (e.g., high-income countries). If campaign is part of the national immunization strategy but has not been implemented since 2005, the tool will assign maximum score. Do not substitute coverage of the follow-up campaign with another non-indiscriminate vaccination activity (e.g., mop-up).	Number of vaccinated children --- Number of children to be vaccinated (target)
Proportion of suspected measles cases who are unvaccinated or have unknown vaccination status	<20% (+4) ≥20% (+8) **Total: 8**	Calculate the proportion of unvaccinated children or those with unknown vaccination status from the most recent year to assign risk point. Limit calculation to only suspected cases who are eligible for MMR1 and older, according to the national immunization schedule.	Suspected cases who were unvaccinated + suspected cases with unknown vaccination status --- Total number of suspected cases who were age eligible for MMR1 vaccination [b]
Subtotal risk points		**40 points**	

Case-Based Surveillance Quality	Cut-off criteria (risk points)	How the risk is calculated	Formula
Reporting rate of suspected measles and rubella cases per 100,000 population	If area population ≥100,000 population: ≥2 per 100,000 (+0) <2 per 100,000 (+4) <1 per 100,000 (+8) If area population <100,000 population: <1 per 100,000 (+8) ≥1 per 100,000 (+0) **Total: 8**	Assign risk point using data from most recent year. When a municipality has less than 100,000 population, assign 0 risk points if the municipality has reported at least 1 case during the most recent year. Assign 8 points if the municipality was epidemiologically silent (did not report any cases).	Number of suspected cases x 100,000 population --- Total population of country
Proportion of cases with adequate investigation	≥80% (+0) <80% (+4) **Total: 4**	Assign risk point using data from most recent year. An adequate investigation is defined as a case investigated within 48 hours of notification and that includes 8 of the 11 core variables: 1) name and/or case identification; 2) date of birth/age; 3) sex; 4) place of residence; 5) vaccination status; 6) date of rash onset; 7) date of notification; 8) date of investigation; 9) date of blood sample collection; 10) presence of fever; and 11) travel history. If no investigations were conducted, then give maximum score.	Number of suspected cases with adequate investigation --- Total number of cases reported
Proportion of cases with adequate specimen collection within 30 days of rash onset	≥80% (+0) <80% (+4) **Total: 4**	Assign risk point using data from most recent year. If no specimens were collected, then give maximum score.	Number of cases with specimen collected within 30 days from date of rash onset --- Total number of cases reported
Proportion of blood specimens received in laboratory in ≤5 days	≥80% (+0) <80% (+4) **Total: 4**	Assign risk point using data from most recent year. Blood specimens should have been received in the laboratory within 5 days of the date of collection. If no specimens were sent, then give maximum score.	Number of reported cases with specimens received ≤5 days from date obtained --- Total number of cases with specimens collected
Subtotal risk points		**20 points**	

Program Delivery Performance indicators	Cut-off criteria (risk points)	How the risk is calculated	Formula
Trends in MMR1 coverage	Increasing or same (+0) ≥ –10% and <0% decline (+2) < –10% decline (+4) **Total: 4**	Assess MMR1 administrative coverage trend from the last 5 years by using the slope of linear function. Risk points are assigned based on the slope of the trend line. A decrease of ≤10% or >10% is represented with negative numbers, and an increase with positive numbers. This means that for every 1 unit change in the year, the coverage will increase or decrease by 1 unit.	Compound formula; not presented here
Trends in MMR2 coverage	Increasing or same (+0) ≥ –10% and <0% decline (+2) < –10% decline (+4) **Total: 4**	Assess MMR2 administrative coverage trend from the last 5 years by using the slope of linear function. Risk points are assigned based on the slope of the trend line. A decrease of ≤10% or >10% is represented with negative numbers, and an increase with positive numbers. This means that for every 1 unit change in the year, the coverage will increase or decrease by 1 unit	Compound formula; not presented here
MMR1–MMR2 drop-out rate [c]	≤5% (+0) >5% (+4) **Total: 4**	Assign risk point using administrative coverage data from most recent year and using a drop-out rate of 5%.	MMR1 coverage – MMR2 coverage ---------- MMR1 coverage
Penta1–MMR1 drop-out rate [c]	≤5% (+0) >5% (+4) **Total: 4**	Assign risk point using administrative coverage data from most recent year and using a drop-out rate of 5%.	Penta1 coverage – MMR1 coverage ---------- Penta1 coverage
Subtotal risk points		**16 points**	

Threat Assessment indicators	Cut-off criteria (risk points)	How the risk is calculated	Formula
≥1 confirmed or measles compatible case reported in a district within the past 12 months among children ≤5 years	Absence of case: (+0) Presence of case: (+2) **Total: 2**	One or more confirmed measles or rubella case(s) reported in children ≤5 years, during the last calendar year. Include cases confirmed by laboratory results, linked epidemiologically, or by clinical symptoms. Exclude discarded cases or those that are pending classification.	Total of confirmed measles and/or rubella cases

≥1 confirmed or measles compatible case(s) reported in a district within the past 12 months among children aged 5–14 years old	Absence of case: (+0) Presence of case: (+2) **Total: 2**	One or more confirmed measles or rubella case(s) reported in children aged 5–14 years old, during the last calendar year. Include cases confirmed by laboratory results, linked epidemiologically, or by clinical symptoms. Exclude discarded cases or those that are pending classification.	Total of confirmed measles and/or rubella cases
≥1 confirmed or measles compatible case(s) reported in a district within the past 12 months among young adults ≥15 years	Absence of case: (+0) Presence of case: (+2) **Total: 2**	One or more confirmed measles or rubella case(s) reported in young adults ≥15 years old, during the last calendar year. Include cases confirmed by laboratory results, linked epidemiologically, or by clinical symptoms. Exclude discarded cases or those that are pending classification.	Total of confirmed measles and/or rubella cases
Population density	≤ Quartile1: 0 > Quartile1 and ≤ Quartile2 : 1 > Quartile2 and ≤ Quartile3 : 2 > Quartile3 and ≤ Quartile4 : 3 > Quartile4: 4 **Total: 4**	Municipality level data if available (check with national statistics office). The median of the population density of all municipalities of any given country will be obtained to establish the quartiles that will allow the allocation of risk points.	Compound formula; not presented here
Presence of vulnerable groups	No vulnerable groups (+0) One risk point for each vulnerable group present (up to maximum of +8) **Total: 8**	Assign one risk point for each of the following vulnerable groups present in a municipality. Please note that the presence of a single condition listed in each question provides a YES answer. 1) Presence of migrant population, internally displaced population, slums, or Indigenous communities; 2) Presence of large influx of tourists or ecotourism destinations; 3) Presence of security and safety concerns that hinders routine vaccination or epidemiological field investigation (e.g., drug trafficking); 4) Presence of calamities or disasters; 5) Limited access to health services due to terrain/transportation issues; 6) Presence of high-traffic transportation hubs, major roads (within and across countries), or zones bordering large urban areas; 7) Presence of border communities; 8) Presence of areas with mass gatherings (e.g., trade/commerce, fairs, markets, sporting events, religious events).	Total of vulnerable groups
Subtotal risk points		**18 points**	

Rapid Response to Imported Cases (information source)	Cut-off criteria (risk points)	How the risk is calculated	Formula
Presence of a trained rapid response team at the subnational level [d]	No rapid response team (+3) Presence of a rapid response team (+0) **Total: 3**	Assign risk point using data from most recent year.	
Proportion of subnational [d] hospitals with staff that are trained to do triage and isolation for measles/rubella highly suspected cases	80%–100% (+0) 50%–79% (+2) <50% (+3) **Total: 3**	Assign risk point using data from most recent year.	Number of hospitals at subnational level with trained staff in triage and isolation --- Total number of hospitals at subnational level
Subtotal risk points		**6 points**	
Total risk points: 100 points			

Notes:

a. Coverage survey estimates available at municipality level, conducted within past five years and including birth cohorts of recent five years, can replace administrative coverage.

b. The denominator includes cases with no data available for vaccination status (blanks).

c. A negative drop-out rate flags data quality issues and therefore, the tool will not assign maximum risk score. Negative drop-out rates should be corrected, if possible, before importing these values into the tool.

d. State, province, department, or equivalent level.

ANNEX 3 | RISK ASSESSMENT CATEGORIES, VARIABLES, AND SCORING: NON-OUTBREAK SCENARIO

Population Immunity indicators (information source)	Cut-off criteria (risk points)	How the risk is calculated	Formula
MMR1 coverage	≥95% (+0) 90%–94% (+2) 85%–89% (+4) 80%–84% (+6) <80% (+10) **Total: 10**	Calculate risk points per each coverage level [a] reported in the past five years and then obtain the average of the risk score, to assign risk point at the municipality level.	Compound formula; not presented here
MMR2 coverage	≥95% (+0) 90%–94% (+2) 85%–89% (+4) 80%–84% (+6) <80% (+10) **Total: 10**	Calculate risk points per each coverage level [a] reported in the past five years and then obtain the average of the risk score, to assign risk point at the municipality level.	Compound formula; not presented here
Coverage of last follow-up campaign	≥95% (+0) 90%–94% (+2) 85%–89% (+4) <85% (+6) No campaign (+10) **Total: 10**	Assess the administrative coverage reported from the last follow-up campaign [a] to assign risk point. If campaign is not part of national strategy, assign 0 risk points (e.g., high-income countries). If campaign is part of the national immunization strategy but has not been implemented since 2005, the tool will assign maximum score. Do not substitute coverage of the follow-up campaign with another non-indiscriminate vaccination activity.	Number of vaccinated children --- Number of children to be vaccinated (target)
Proportion of suspected measles cases who are unvaccinated or have unknown vaccination status	<20% (+4) ≥20% (+10) **Total: 10**	Calculate the proportion of unvaccinated children or those with unknown vaccination status from the most recent year to assign risk point. Limit calculation to only suspected cases who are eligible for MMR1 and older, according to the national immunization schedule.	Suspected cases who were unvaccinated + suspected cases with unknown vaccination status --- Total number of suspected cases who were age-eligible for MMR1 vaccination [b]
Subtotal risk points		**40 points**	

Case-Based Surveillance Quality	Cut-off criteria (risk points)	How the risk is calculated	Formula
Reporting rate of suspected measles and rubella cases per 100,000 population	If area population ≥100,000 population: ≥2 per 100,000 (+0) <2 per 100,000 (+4) <1 per 100,000 (+8) If area population <100,000 population: <1 per 100,000 (+8) ≥1 per 100,000 (+0) **Total: 8**	Assign risk point using data from most recent year. When a municipality has less than 100,000 population, assign 0 risk points if the municipality has reported at least 1 case during the most recent year. Assign 8 points if the municipality was epidemiologically silent (did not report any case).	Number of suspected cases x 100,000 population --- Total population of country
Proportion of cases with adequate investigation	≥80% (+0) <80% (+4) **Total: 4**	Assign risk point using data from most recent year. An adequate investigation is defined as a case investigated within 48 hours of notification and that includes 8 of the 11 core variables: 1) name and/or case identification; 2) date of birth/age; 3) sex; 4) place of residence; 5) vaccination status; 6) date of rash onset; 7) date of notification; 8) date of investigation; 9) date of blood sample collection; 10) presence of fever; and 11) travel history. If no investigations were conducted, then give maximum score.	Number of suspected cases with adequate investigation --- Total number of cases reported
Proportion of cases with adequate specimen collection within 30 days of rash onset	≥80% (+0) <80% (+4) **Total: 4**	Assign risk point using data from most recent year. If no specimens were collected, then give maximum score.	Number of cases with specimen collected within 30 days from date of rash onset --- Total number of cases reported
Proportion of blood specimens received in laboratory in ≤5 days	≥80% (+0) <80% (+4) **Total: 4**	Assign risk point using data from most recent year. Blood specimens should have been received in the laboratory within 5 days of the date of collection. If no specimens were sent, then give maximum score.	Number of reported cases with specimens received ≤5 days from date obtained --- Total number of cases with specimens collected
Subtotal risk points		**20 points**	

Program Delivery Performance indicators (information source)	Cut-off criteria (risk points)	How the risk is calculated	Formula
Trends in MMR1 coverage	Increasing or same (+0) ≥ –10% and <0% decline (+2) < –10% decline (+4) **Total: 4**	Assess MMR1 administrative coverage trend from the last 5 years by using the slope of linear function. Risk points are assigned based on the slope of the trend line. A decrease of ≤10% or >10% is represented with negative numbers, and an increase with positive numbers. This means that for every 1 unit change in the year, the coverage will increase or decrease by 1 unit.	Compound formula; not presented here
Trends in MMR2 coverage	Increasing or same (+0) ≥ –10% and <0% decline (+2) < –10% decline (+4) **Total: 4**	Assess MMR1 administrative coverage trend from the last 5 years by using the slope of linear function. Risk points are assigned based on the slope of the trend line. A decrease of ≤10% or >10% is represented with negative numbers, and an increase with positive numbers. This means that for every 1 unit change in the year, the coverage will increase or decrease by 1 unit.	Compound formula; not presented here
MMR1–MMR2 drop-out rate [c]	≤5% (+0) >5% (+4) **Total: 4**	Assign risk point using administrative coverage data from most recent year and using a drop-out rate of 5%.	MMR1 coverage – MMR2 coverage --- MMR1 coverage
Penta1–MMR1 drop-out rate [c]	≤5% (+0) >5% (+4) **Total: 4**	Assign risk point using administrative coverage data from most recent year and using a drop-out rate of 5%.	Penta1 coverage – MMR1 coverage --- Penta1 coverage
Subtotal risk points		**16 points**	

Threat Probability Assessment indicators (information source)	Cut-off criteria (risk points)	How the risk is calculated	Formula
Population density	≤ Quartile1: 0 > Quartile1 and ≤ Quartile2 : 1 > Quartile2 and ≤ Quartile3 : 2 > Quartile3 and ≤ Quartile4 : 3 > Quartile4: 4 **Total: 4**	Municipality level data if available (check with national statistics office). The median of the population density of all municipalities of any given country will be obtained to establish the quartiles that will allow the allocation of risk points.	Compound formula; not presented here
Presence of vulnerable groups	No vulnerable groups (+0) One risk point for each vulnerable group present (up to maximum of +8) **Total: 8**	Assign one risk point for each of the following vulnerable groups present in a municipality. Please note that the presence of single condition listed in each question provides a YES answer. 1) Presence of migrant population, internally displaced population, slums, or Indigenous communities; 2) Presence of large influx of tourists and ecotourism destinations; 3) Presence of security and safety concerns that hinders routine vaccination or epidemiological field investigation (e.g., drug trafficking); 4) Presence of calamities or disasters; 5) Limited access to health services due to terrain/transportation issues; 6) Presence of high-traffic transportation hubs, major roads (within and across countries), or zones bordering large urban areas; 7) Presence of border communities; 8) Presence of areas with mass gatherings (e.g., trade/commerce, fairs, markets, sporting events, religious events).	Total of vulnerable groups
Subtotal risk points		**12 points**	

Rapid Response to Imported Cases (information source)	Cut-off criteria (risk points)	How the risk is calculated	Formula
Presence of a trained rapid response team at the subnational level [d]	No rapid response team (+6) Presence of a rapid response team (+0) **Total: 6**	Assign risk point using data from most recent year.	
Proportion of subnational [d] hospitals with trained staff to do triage and isolation for measles/rubella highly suspected cases	80%–100% (+0) 50%–79% (+2) <50% (+6) **Total: 6**	Assign risk point using data from most recent year.	Number of hospitals at subnational level with trained staff in triage and isolation --- Total number of hospitals at subnational level
Subtotal risk points		**12 points**	
Total risk points: 100 points			

Notes:
a. Coverage survey estimates available at municipality level (conducted within past five years and including birth cohorts of recent five years) can replace administrative coverage.
b. The denominator includes cases with no data available for vaccination status (blanks).
c. A negative drop-out rate flags data quality issues and therefore, the tool will not assign maximum risk score. Negative drop-out rates should be corrected, if possible, before importing these values into the tool.
d. State, province, department, or equivalent level.

The Measles and Rubella Risk Assessment Tool aims to identify and prioritize local areas that are not meeting the measles and rubella programmatic targets for the implementation of immediate corrective actions. This will contribute to the relentless efforts of Pan American Health Organization Member States to sustain the gains in the elimination of measles and rubella in their territories. The current tool is adapted from the World Health Organization risk assessment tool, to include risk variables that will address challenging epidemiological scenarios. The tool was widely piloted through three workshops targeting its end users in Latin America and the Caribbean.

PAHO
Pan American Health Organization
World Health Organization
Regional Office for the Americas

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