Global Health Consortium (GHC)
INTERNATIONAL GLOBAL HEALTH CONFERENCE
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"Measles: a Global and Regional Threat"

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Pan American Health Organization

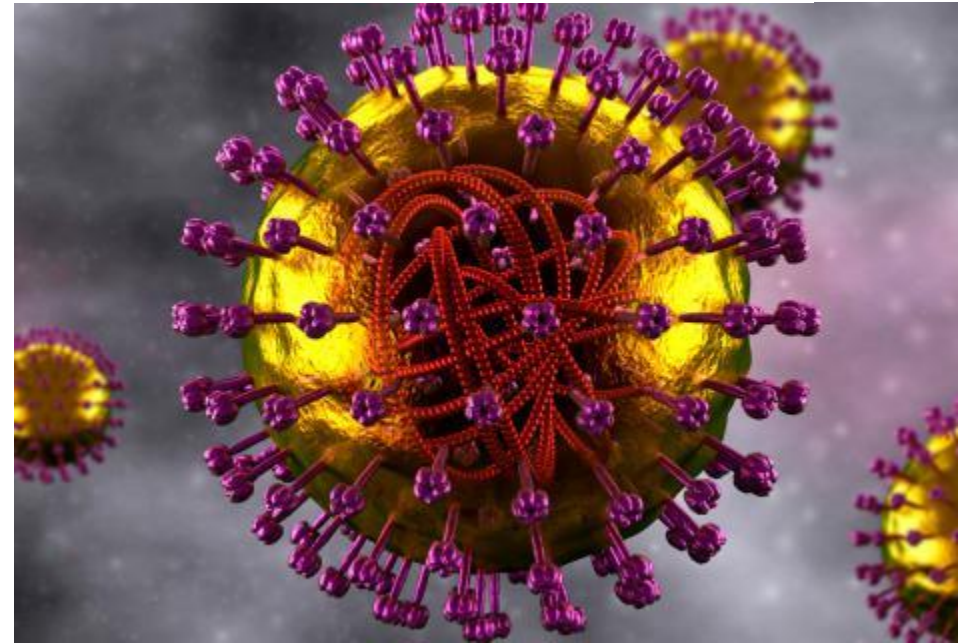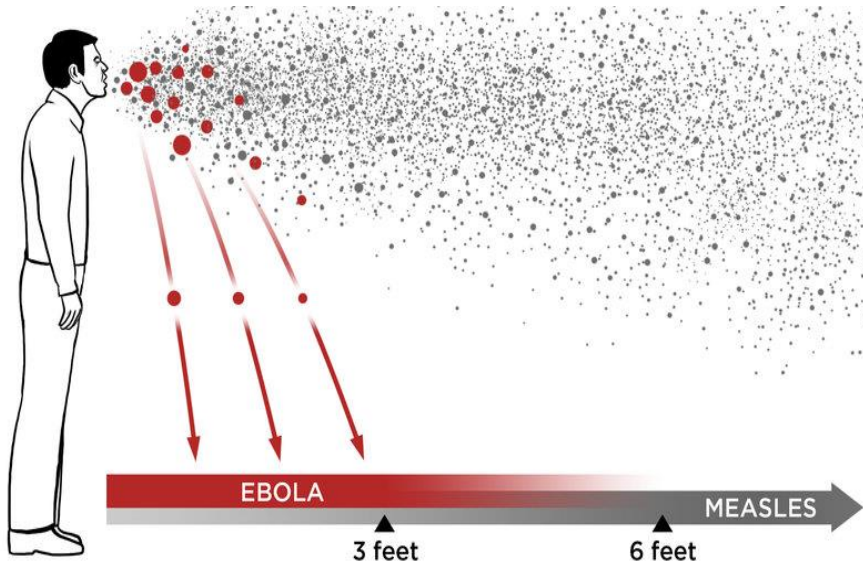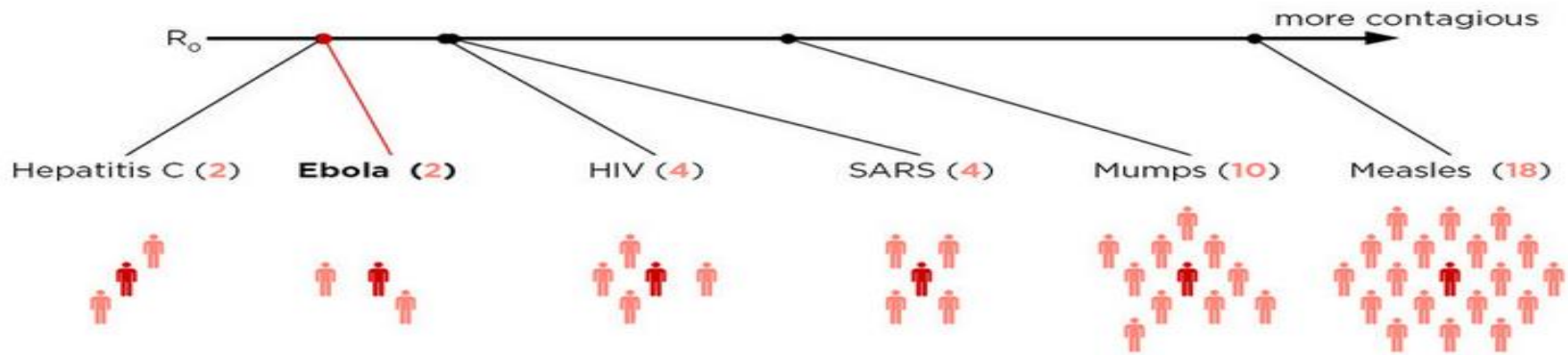**World Health Organization**
REGIONAL OFFICE FOR THE **Americas**

Outline

❖ **Global measles situation**
❖ Main challenges of the post-elimination era in the Americas
❖ Conclusions
❖ Next steps

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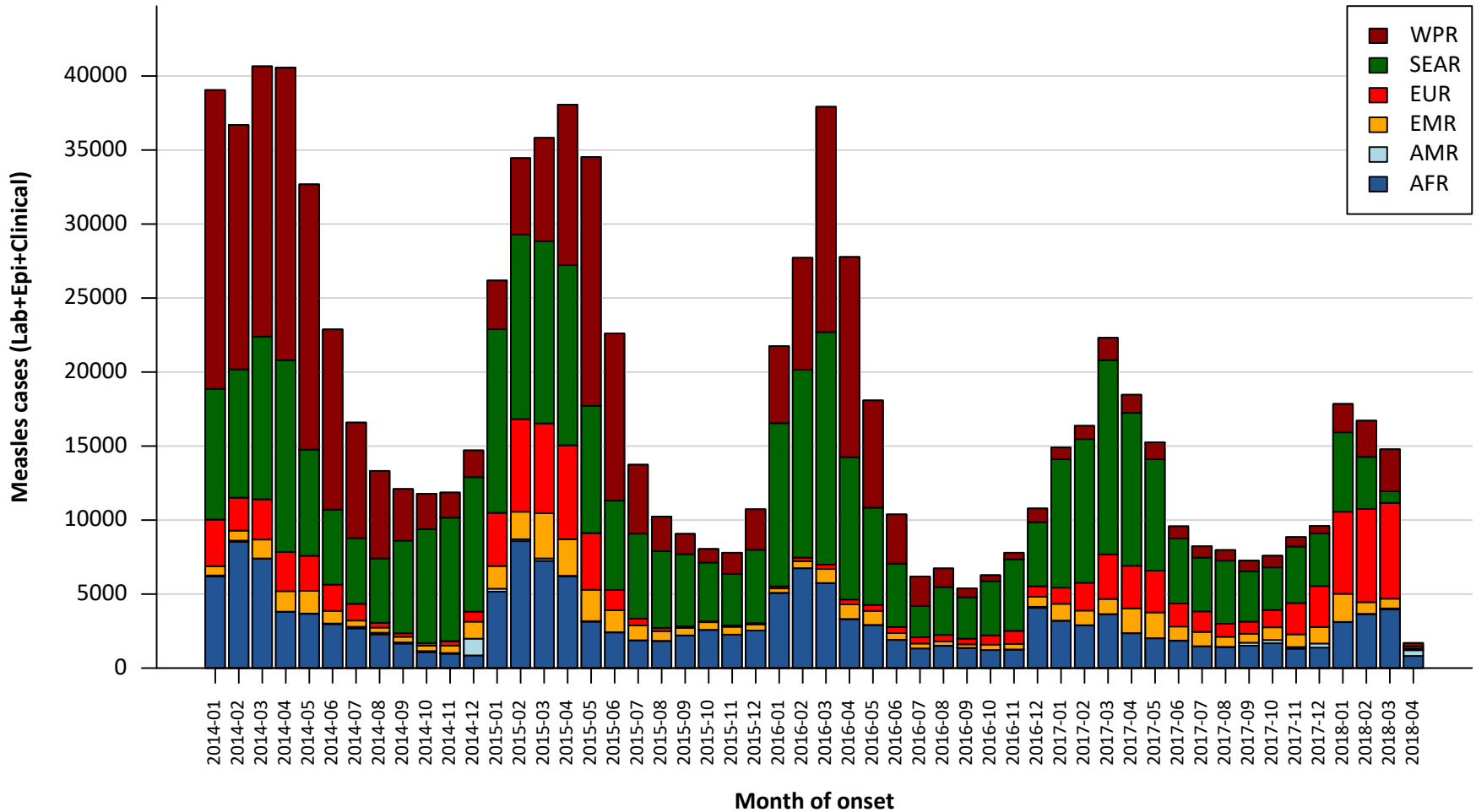World Health Organization
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Measles virus

- *Morbillivirus, Paramyxorividae family.*

The number of **people** that **one sick person** will infect (on average) is called R_0. Here are the maximum R_0 values for a few viruses.

R_0 — more contagious

Hepatitis C (2)   Ebola (2)   HIV (4)   SARS (4)   Mumps (10)   Measles (18)

EBOLA — MEASLES

3 feet   6 feet

Measles case distribution by month and WHO Regions, 2014-2018.

Notes: Based on data received 2018-05 - Data Source: IVB Database - This is surveillance data, hence for the last month(s), the data may be incomplete.

Number and measles incidence rate per million April 2017 – March 2018.

Top 10**

Country	Cases	Rate
India	41041	30.99
Ukraine	13446	302.57
Nigeria	9315	50.08
Indonesia	6978	26.72
Philippines	6312	61.09
Pakistan	5982	30.96
China	4984	3.55
Italy	4450	74.88
Serbia	4349	493.08
DR Congo	3684	46.79
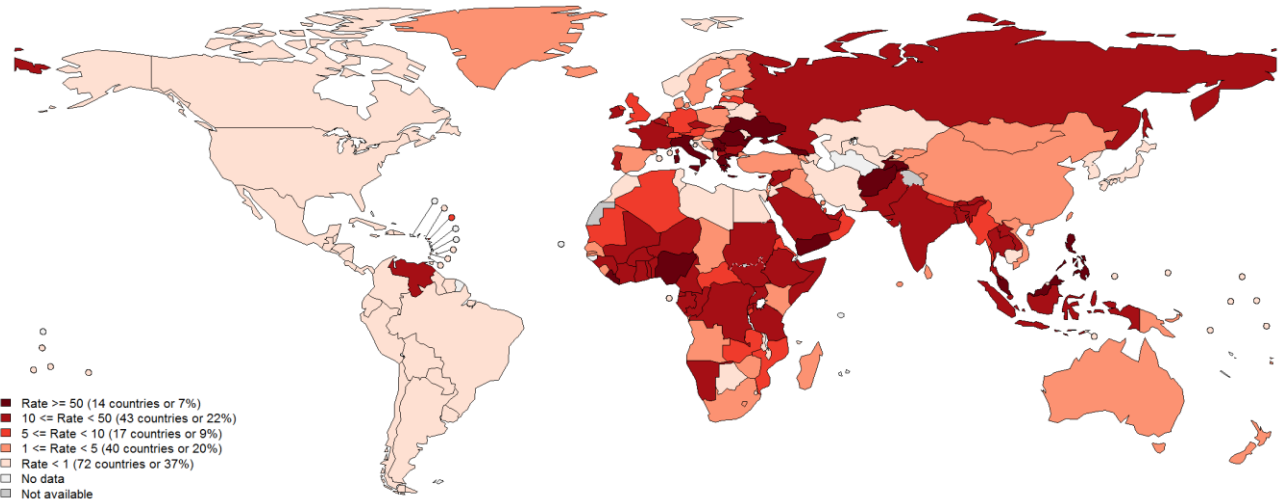
Other countries with high incidence rates***

Country	Cases	Rate
Greece	2400	214.60
Liberia	892	193.33
Romania	3242	163.92
Georgia	538	137.06
Yemen	2449	88.78
Malaysia	2399	76.92

Rate >= 50 (14 countries or 7%)
10 <= Rate < 50 (43 countries or 22%)
5 <= Rate < 10 (17 countries or 9%)
1 <= Rate < 5 (40 countries or 20%)
Rate < 1 (72 countries or 37%)
No data
Not available

World Health Organization

Map production: World Health Organization, WHO, 2018. All rights reserved
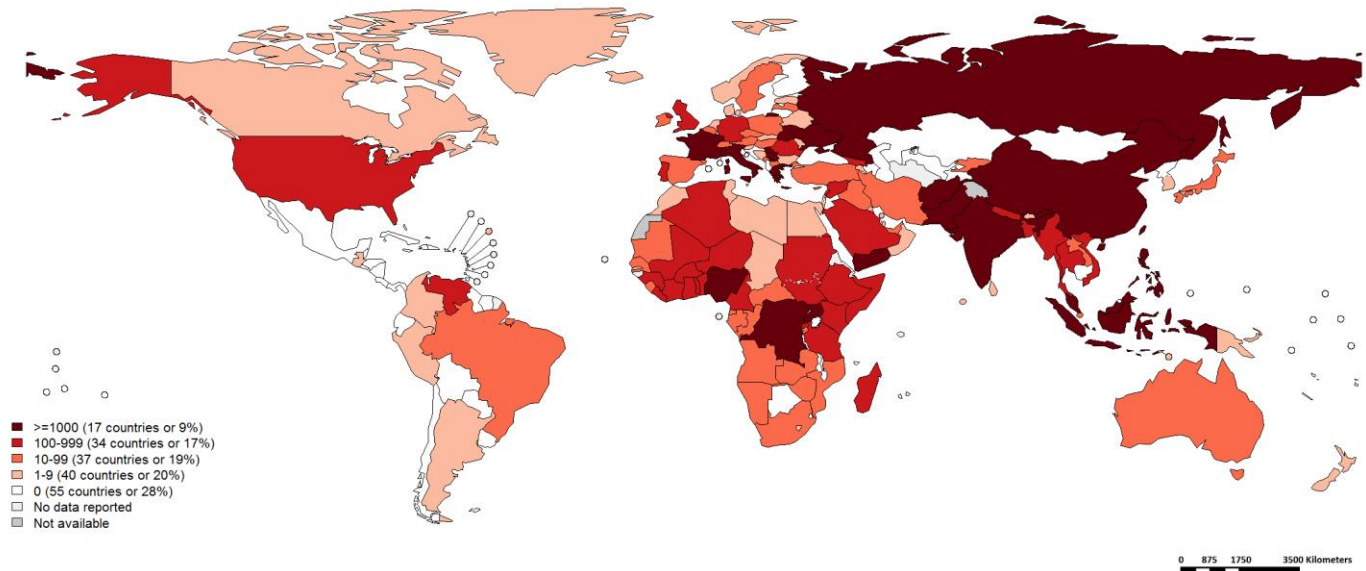Data source: IVB Database

0   875   1750   3500 Kilometers

Disclaimer:
The boundaries and names shown and the designations used on this map do notimply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Measles cases from countries with known discrepancies between case-based and aggregate surveillance, as reported by country			
Country	Year	Cases	Data Source
DR Congo	2017	45,165	SITUATION EPIDEMIOLOGIQUE DE LA ROUGEOLE EN RDC, Week of 27/3/2018
	2018	5143	
Somalia	2017	23,353	Somali EPI/POL Weekly Update Week 18, 2018
	2018	5242	

Notes: Based on data received 2018-05 and covering the period between 2017-04 and 2018-03 - Incidence: Number of cases / population* * 100,000 - * World population prospects, 2017 revision - ** Countries with the highest number of cases for the period - *** Countries with the highest incidence rates (excluding those already listed in the table above)

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Number of Reported Measles Cases.
October 2017 – March 2018.

Top 10*	
Country	**Cases**
India	15992
Ukraine	11653
Philippines	5502
Serbia	4344
Nigeria	3298
DR Congo	2376
Greece	2175
Pakistan	1933
China	1910
Indonesia	1866

■ >=1000 (17 countries or 9%)
■ 100-999 (34 countries or 17%)
■ 10-99 (37 countries or 19%)
■ 1-9 (40 countries or 20%)
□ 0 (55 countries or 28%)
□ No data reported
■ Not available

0   875   1750   3500 Kilometers

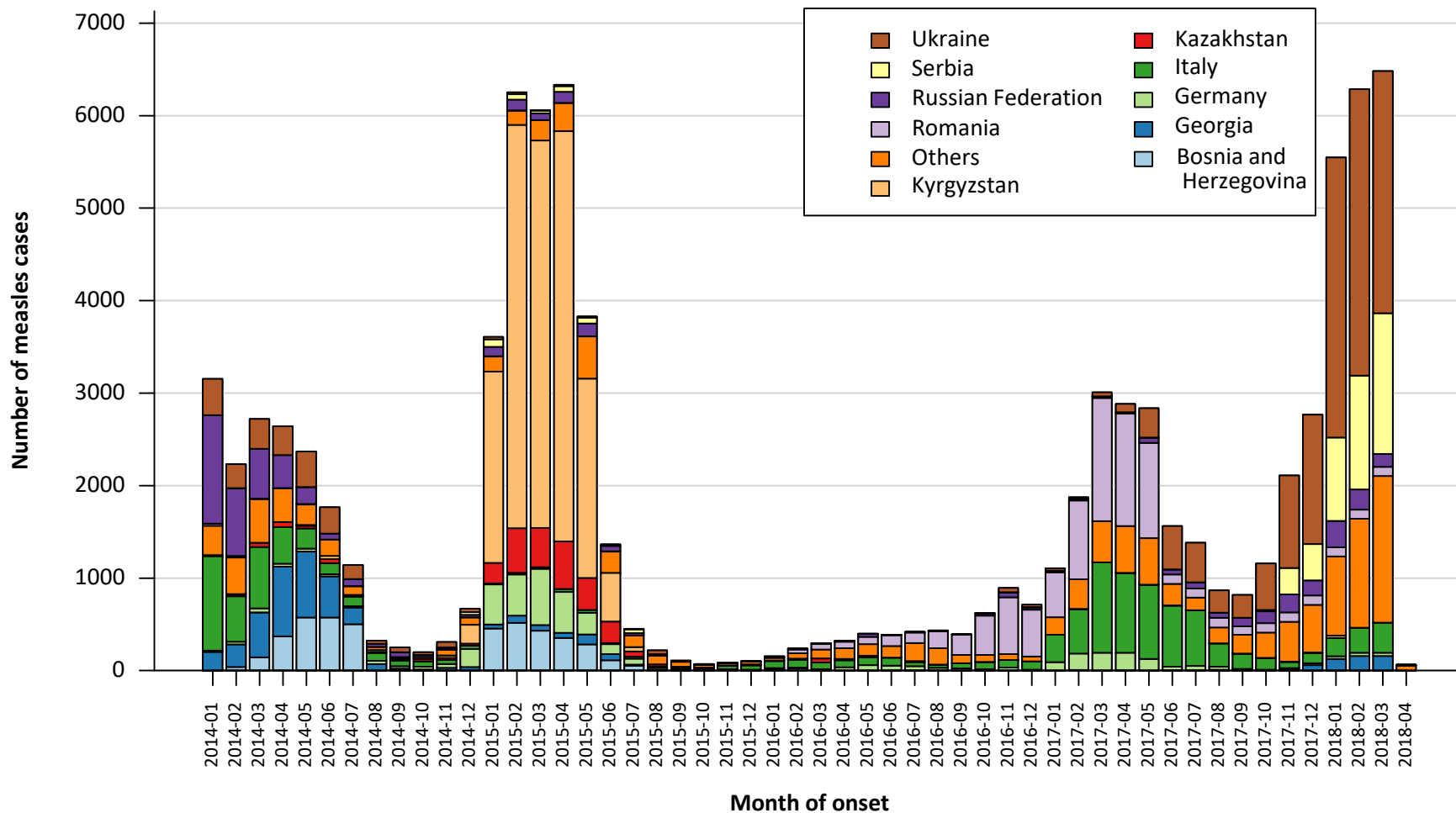**World Health Organization**

Map production: World Health Organization, WHO, 2018. All rights reserved
Data source: IVB Database

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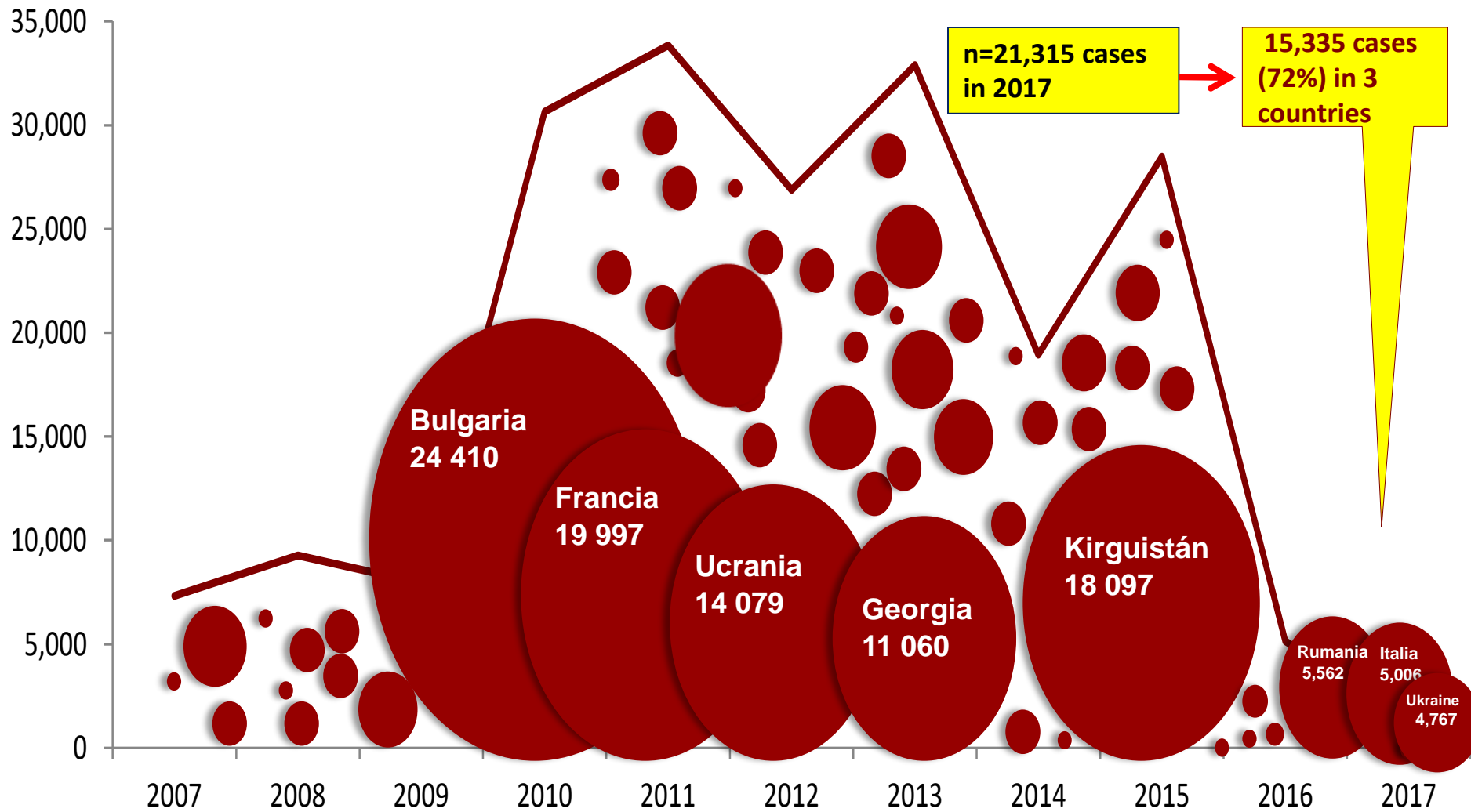
Notes: Based on data received 2018-05 - Surveillance data from 2017-10 to 2018-03 - * Countries with highest number of cases for the period

Measles case distribution (EUR), 2014-2018

Legend: Ukraine, Serbia, Russian Federation, Romania, Others, Kyrgyzstan, Kazakhstan, Italy, Germany, Georgia, Bosnia and Herzegovina

Number of measles cases (y-axis)

Month of onset (x-axis)

Notes: Based on data received 2018-05 - Data Source: IVB Database

Number of measles cases in Europe, 2007-2017*

n=21,315 cases in 2017

15,335 cases (72%) in 3 countries

Bulgaria 24 410

Francia 19 997

Ucrania 14 079

Georgia 11 060

Kirguistán 18 097

Rumania 5,562

Italia 5,006

Ukraine 4,767

Source: **WHO regional office of Europe**

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Measles case distribution (AFR), 2014-2018
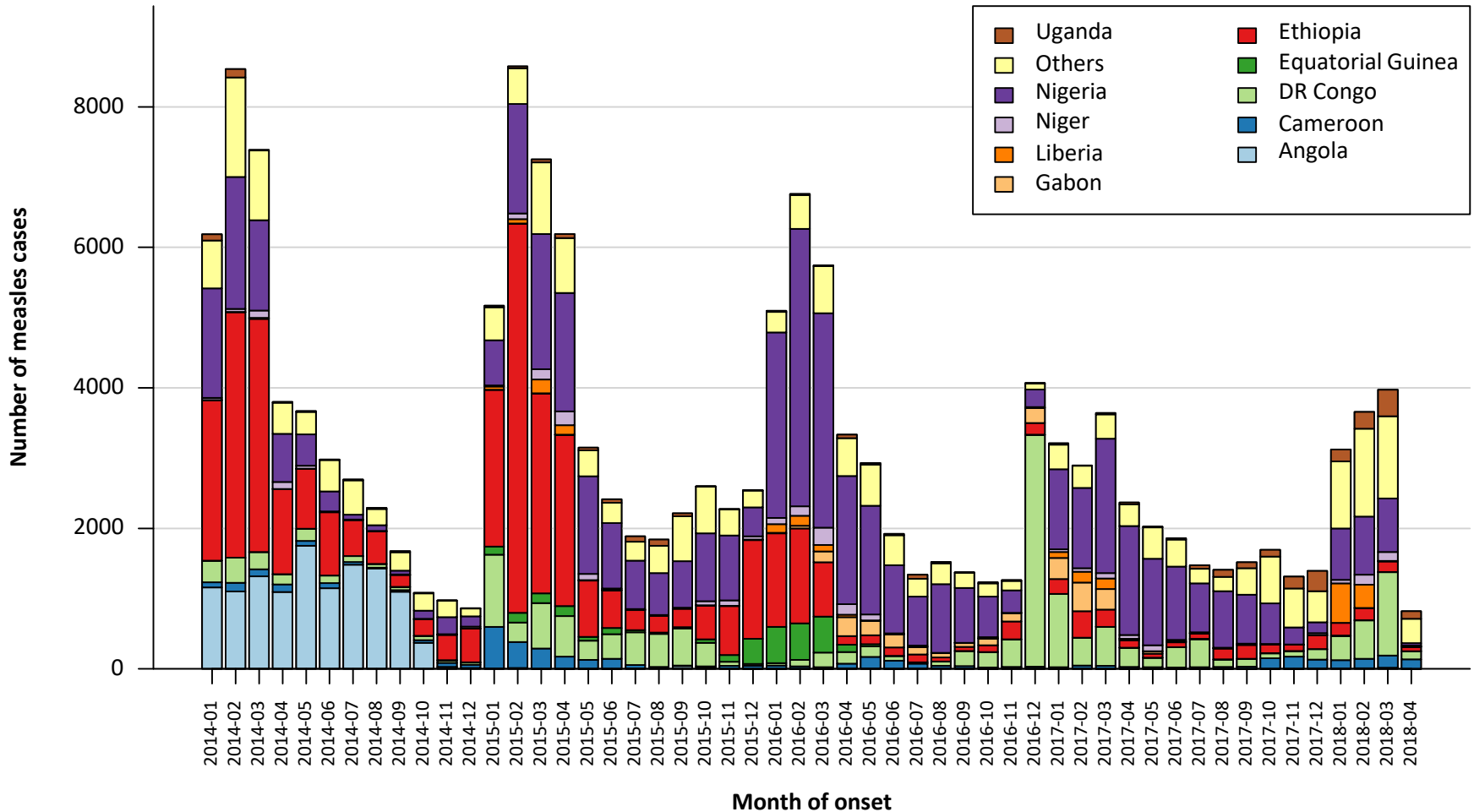
Notes: Based on data received 2018-05 - Data Source: IVB Database
DRC has experienced a nationwide epidemic that has affected all Provinces, however, only a small proportion of the measles cases in the IDSR aggregate reporting system are reflected in the case based data. As of 27 May 2013, South Sudan has reassigned to the Africa region (AFR) from the Eastern Mediterranean region (EMR). For data presentation and statistical purposes, South Sudan data is presented in AFR for all the years.

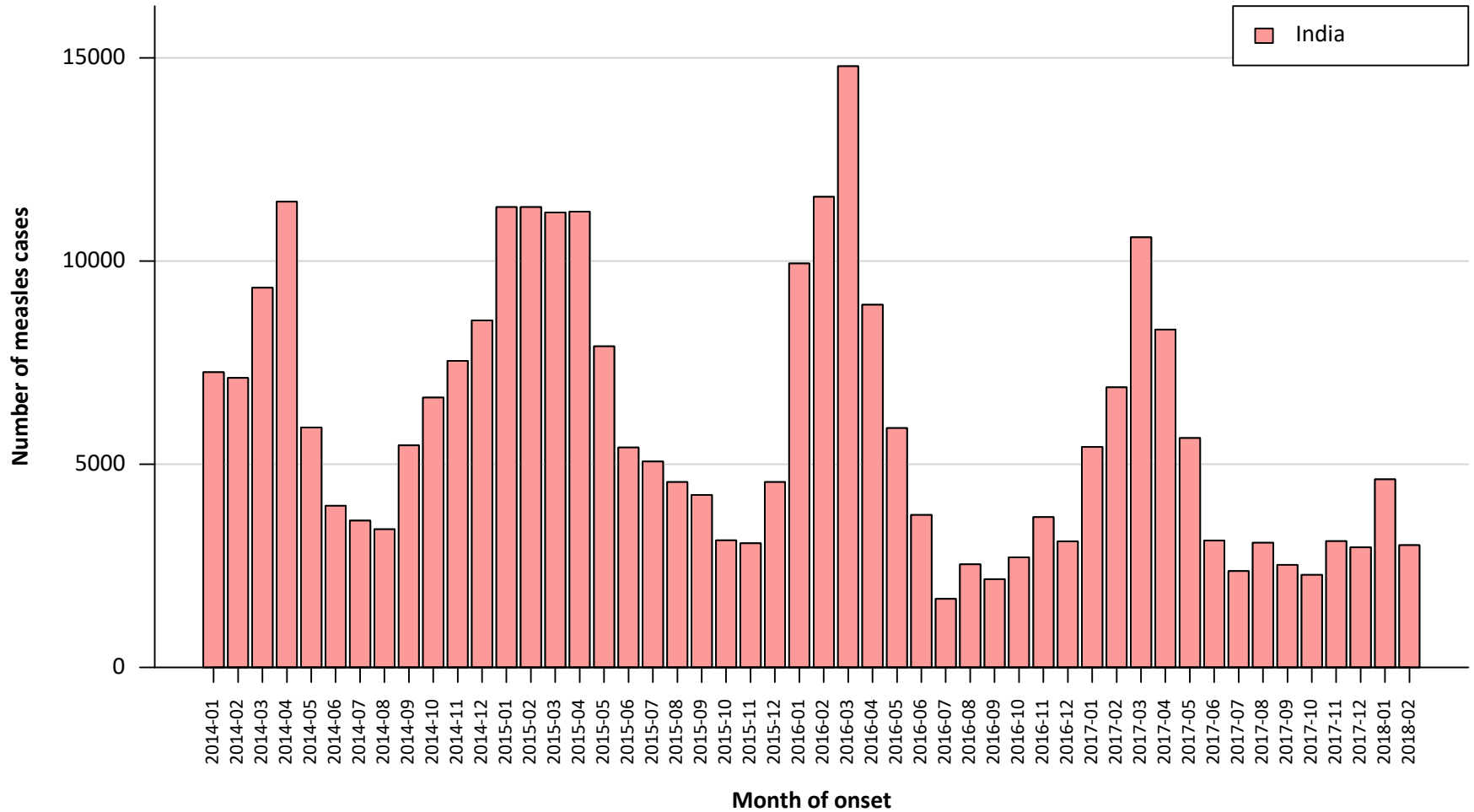# Measles case distribution (EMR), 2014-2018
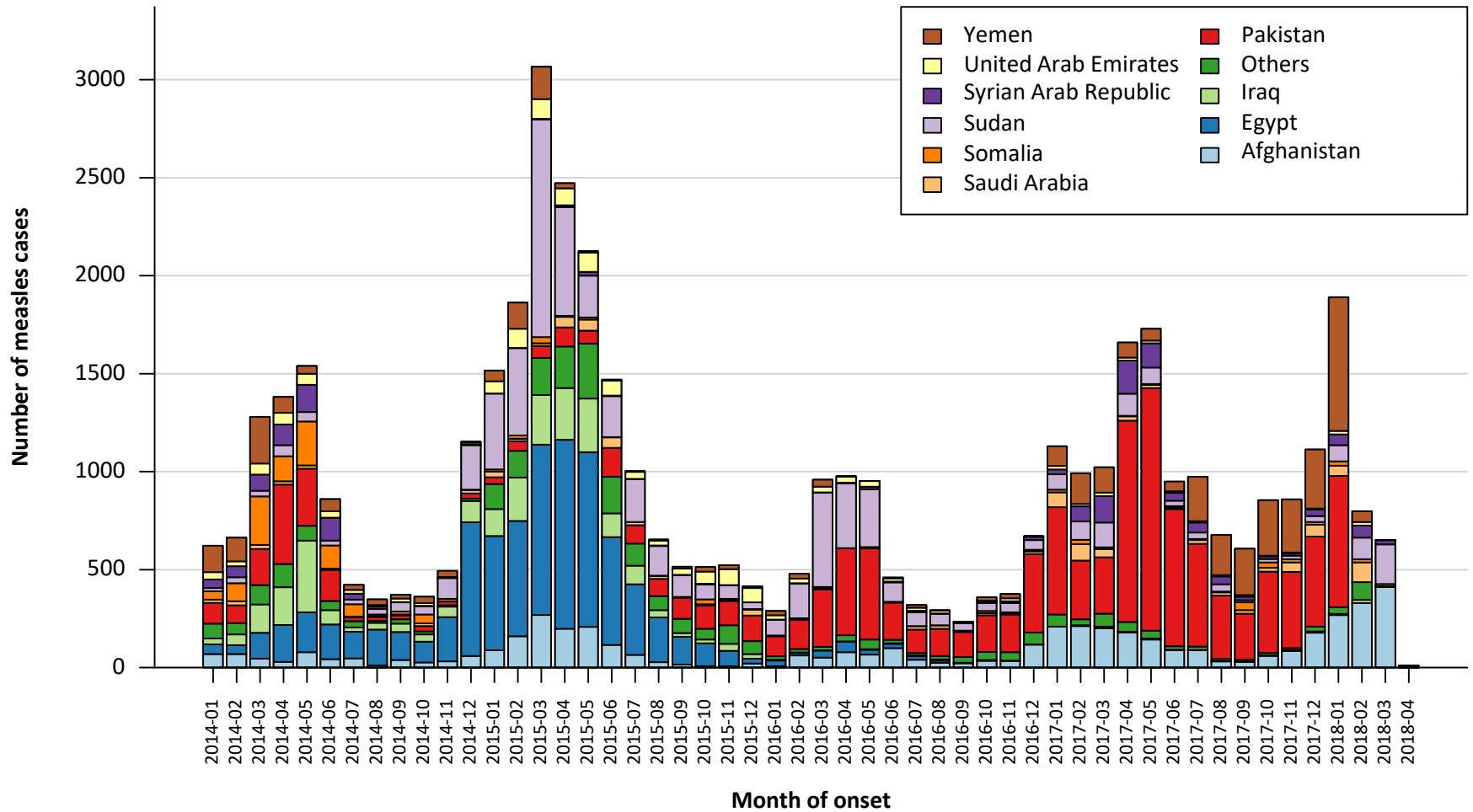
Notes: Based on data received 2018-05 - Data Source: IVB Database

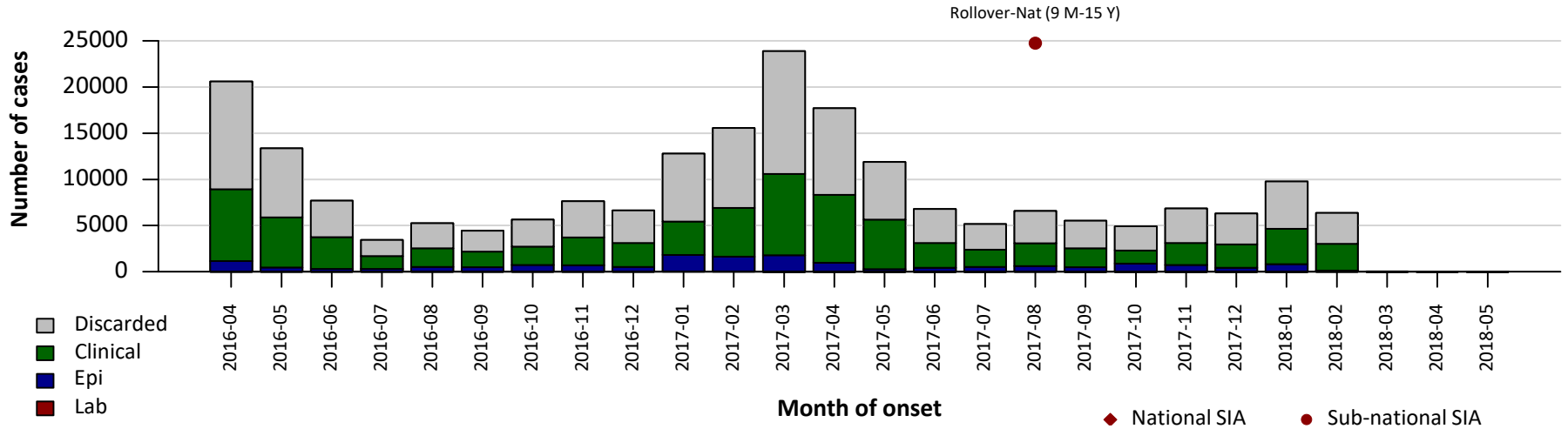# Measles case distribution (SEAR) (excl. India), 2014-2018
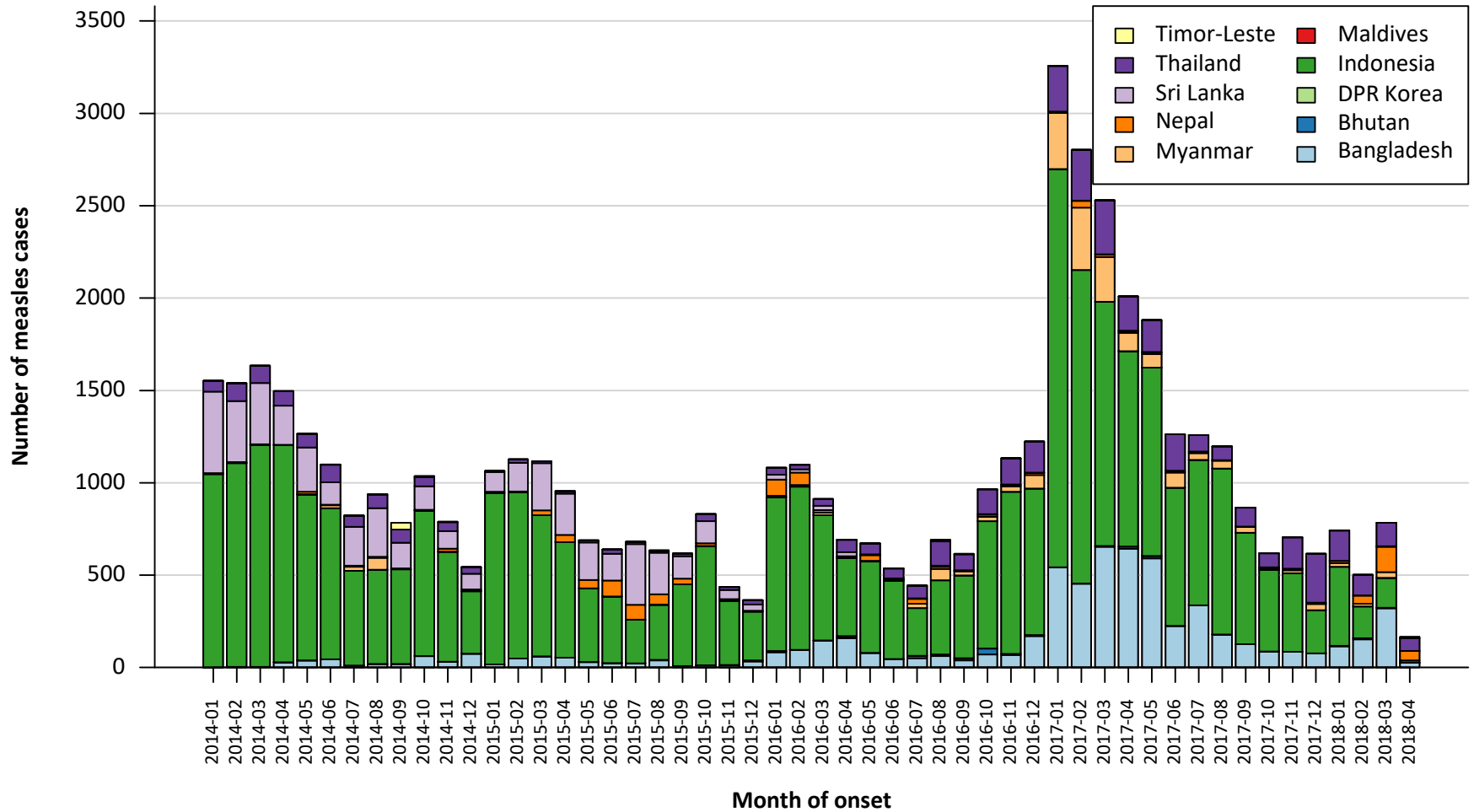
Notes: Based on data received 2018-05 - Data Source: IVB Database
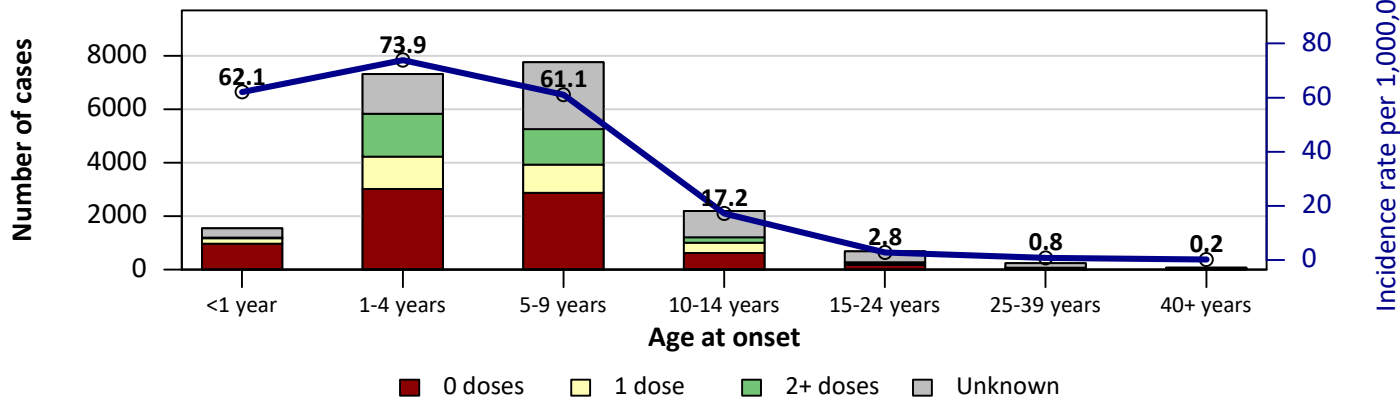
Measles case distribution (SEAR, India), 2014-2018

Notes: Based on data received 2018-05 - Data Source: IVB Database
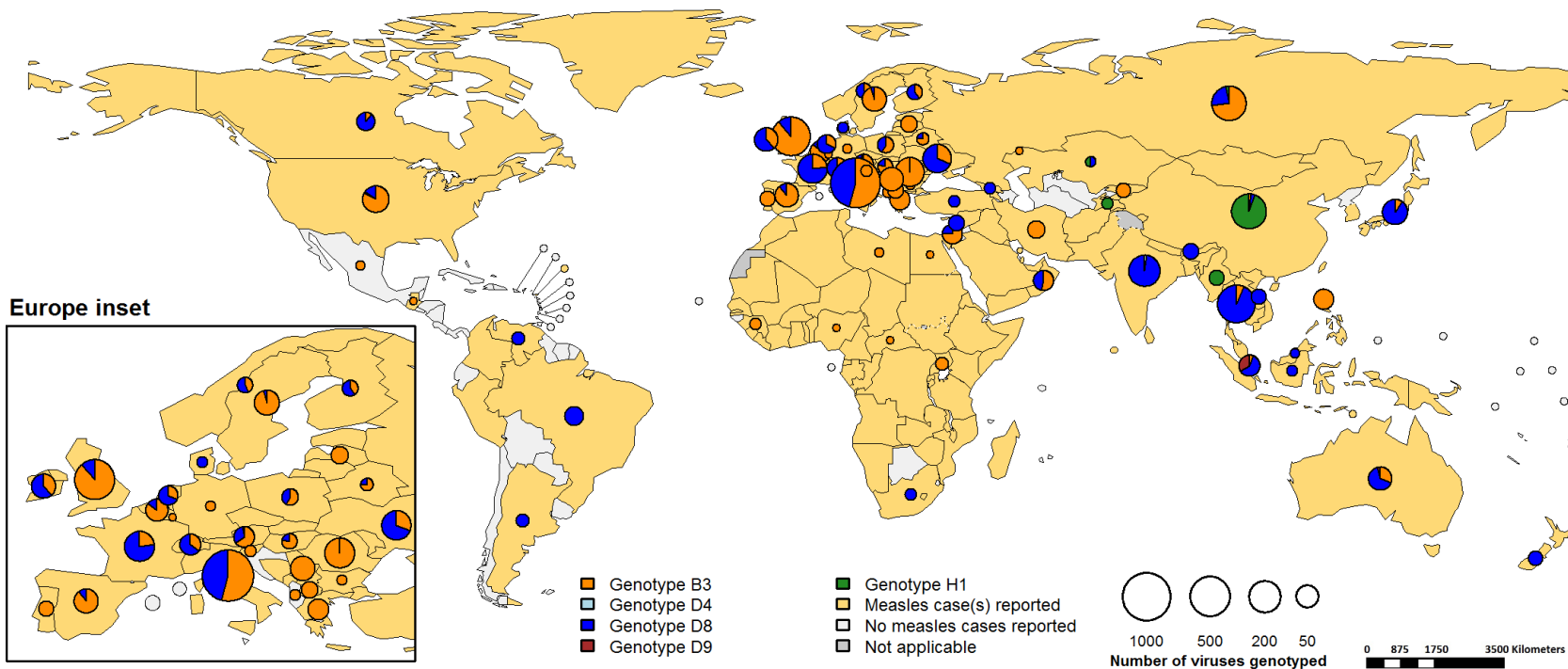
Measles cases: India 2016 - 2018

Rollover-Nat (9 M-15 Y)

Number of cases (top chart, y-axis): 0, 5000, 10000, 15000, 20000, 25000

Month of onset (x-axis): 2016-04, 2016-05, 2016-06, 2016-07, 2016-08, 2016-09, 2016-10, 2016-11, 2016-12, 2017-01, 2017-02, 2017-03, 2017-04, 2017-05, 2017-06, 2017-07, 2017-08, 2017-09, 2017-10, 2017-11, 2017-12, 2018-01, 2018-02, 2018-03, 2018-04, 2018-05

Legend:
- Discarded (grey)
- Clinical (green)
- Epi (blue)
- Lab (dark red)

◆ National SIA   ● Sub-national SIA

India age distribution, vaccination status, and incidence, 2017-04 to 2018-03

Incidence rate values: 62.1, 73.9, 61.1, 17.2, 2.8, 0.8, 0.2

Age at onset: <1 year, 1-4 years, 5-9 years, 10-14 years, 15-24 years, 25-39 years, 40+ years

Legend: 0 doses | 1 dose | 2+ doses | Unknown

Year	Confirmed Cases
2014	80306
2015	83026
2016	70798
2017	56302
2018	7645

Distribution of measles genotypes
(April 2017 – March 2018)

Europe inset

Genotype B3
Genotype D4
Genotype D8
Genotype D9

Genotype H1
Measles case(s) reported
No measles cases reported
Not applicable

1000 500 200 50
Number of viruses genotyped

0   875   1750   3500 Kilometers

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Map production: World Health Organization, WHO, 2018. All rights reserved
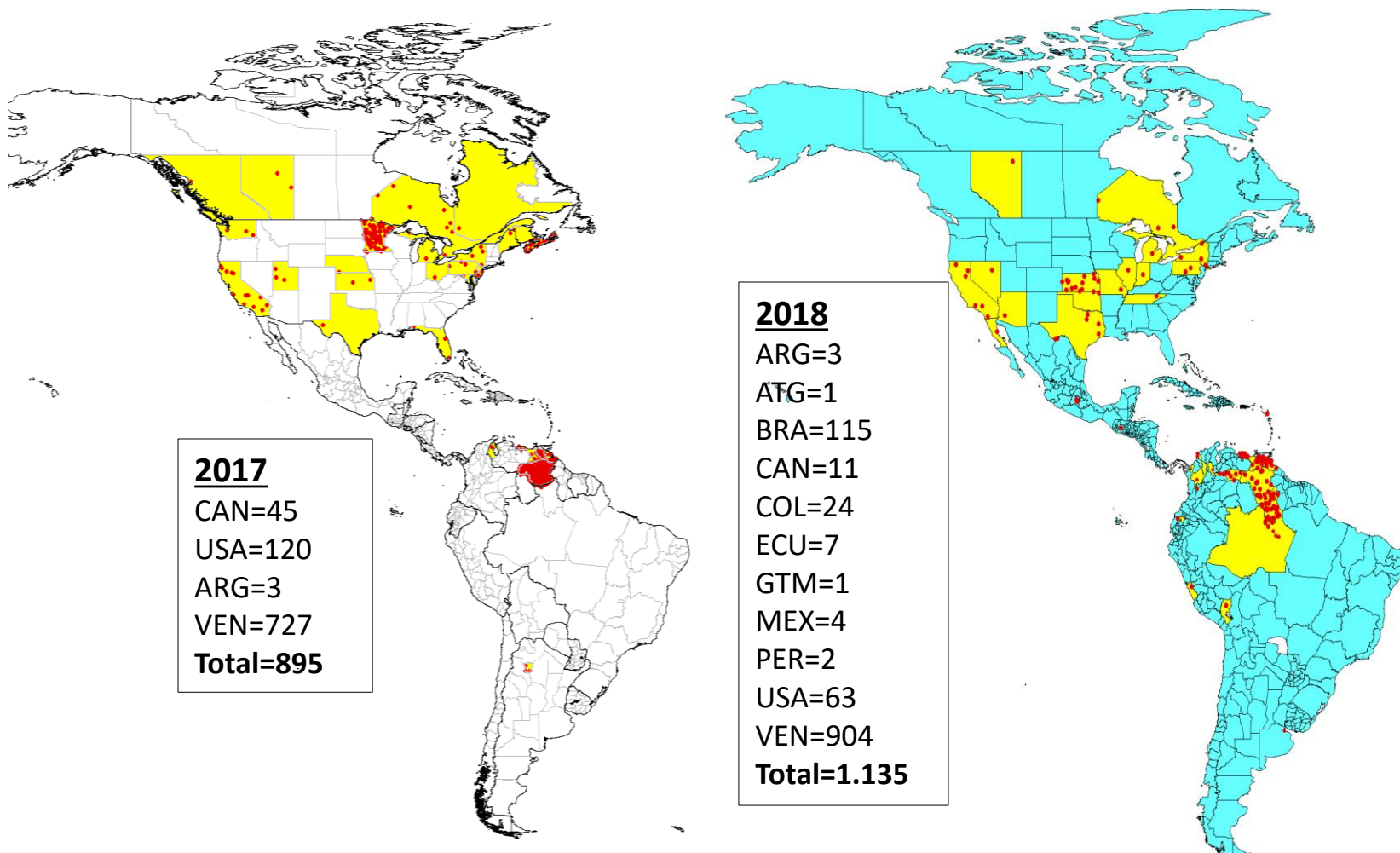**Data source:** IVB & MeaNS Databases

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Notes: Data Source: MeaNS database (Genotypes) and IVB Database (Incidence) as of 2018-05-09 and covering the period 2017-04-01 to 2018-03-31 - Pie charts proportional to the number of sequenced viruses

Outline

❖ Global measles situation

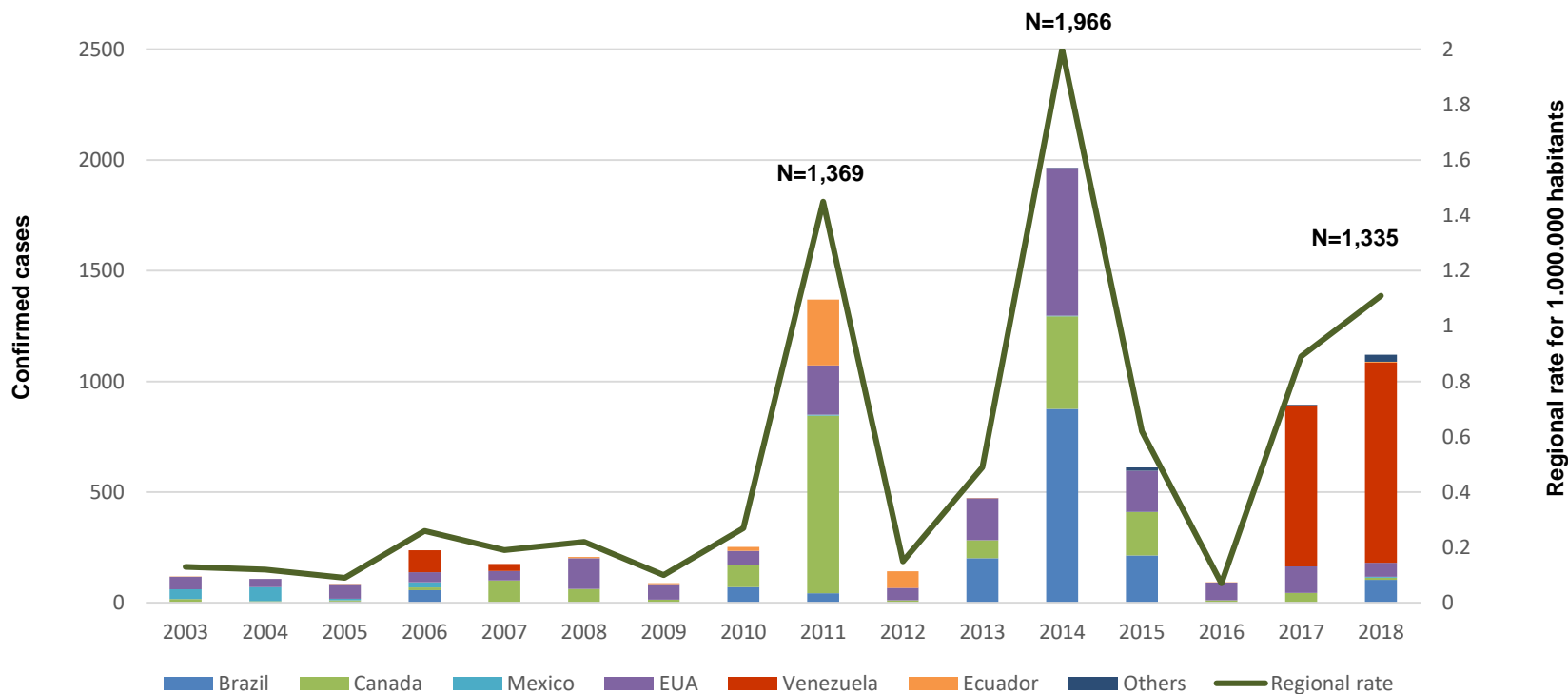❖ **Main challenges of post-elimination era in the Americas**

❖ Conclusions

Distribution of confirmed measles cases by countries. The Americas 2017-2018*.

2017
CAN=45
USA=120
ARG=3
VEN=727
Total=895

2018
ARG=3
ATG=1
BRA=115
CAN=11
COL=24
ECU=7
GTM=1
MEX=4
PER=2
USA=63
VEN=904
Total=1.135

Sources: Surveillance country reports sent to the Immunization Unit of PAHO/WHO and by the Ministry of Popular Power of Venezuela.   *Data as of May 11, 2018

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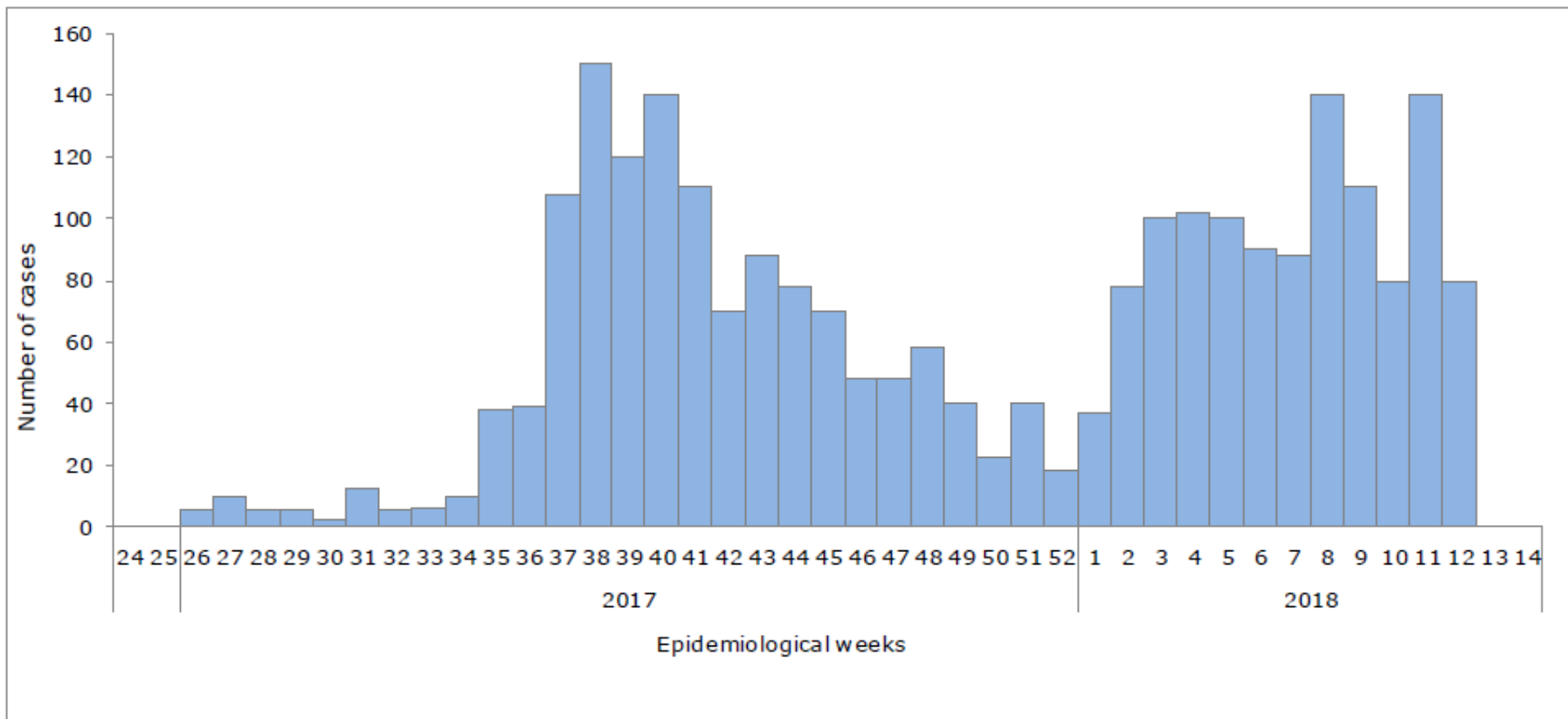World Health Organization
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Measles outbreaks in the post elimination era. The Americas, 2003-2018*

Sources: Surveillance country reports sent to the Immunization Unit of PAHO/WHO and by the Ministry of Popular Power of Venezuela.   *Data as of May 11, 2018
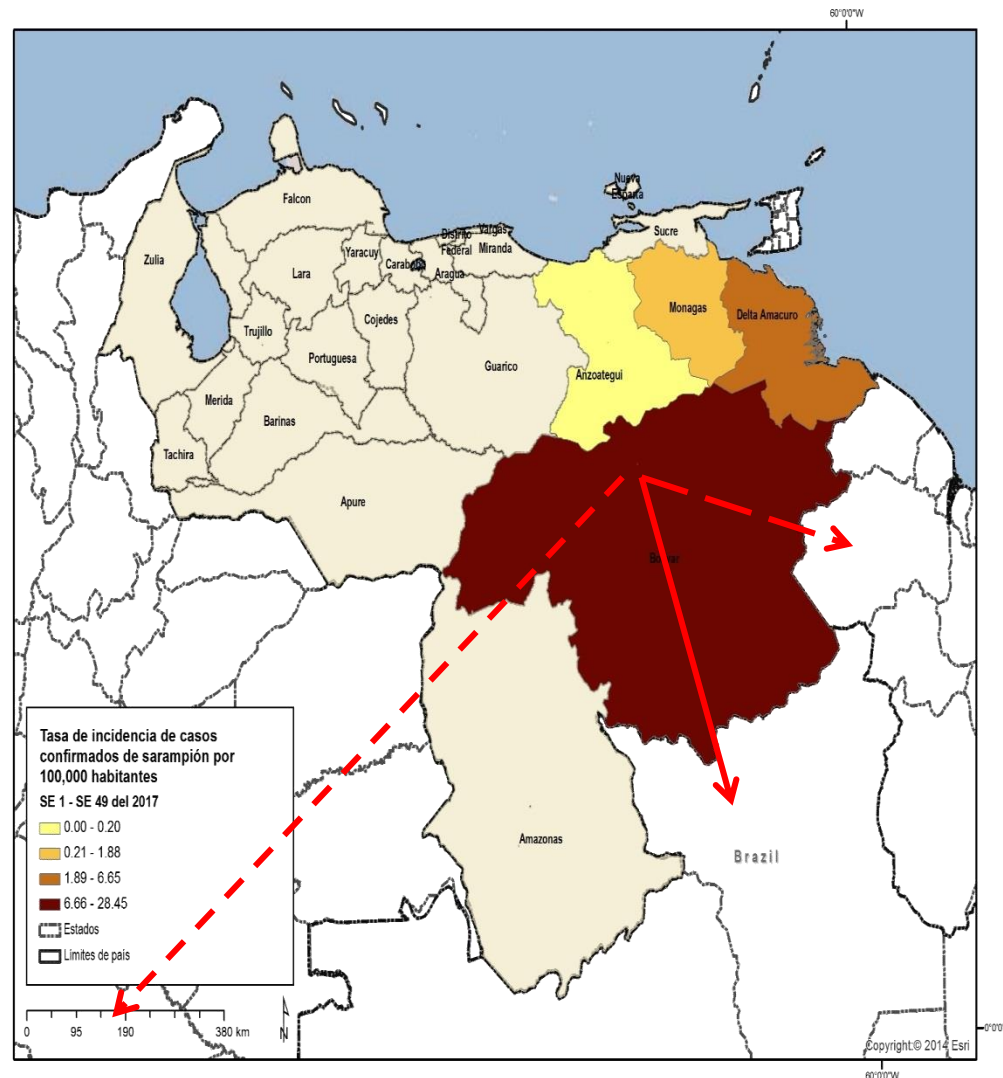
Reported measles cases by EW of rash onset. Venezuela. EW 26 of 2017 to EW 12 of 2018
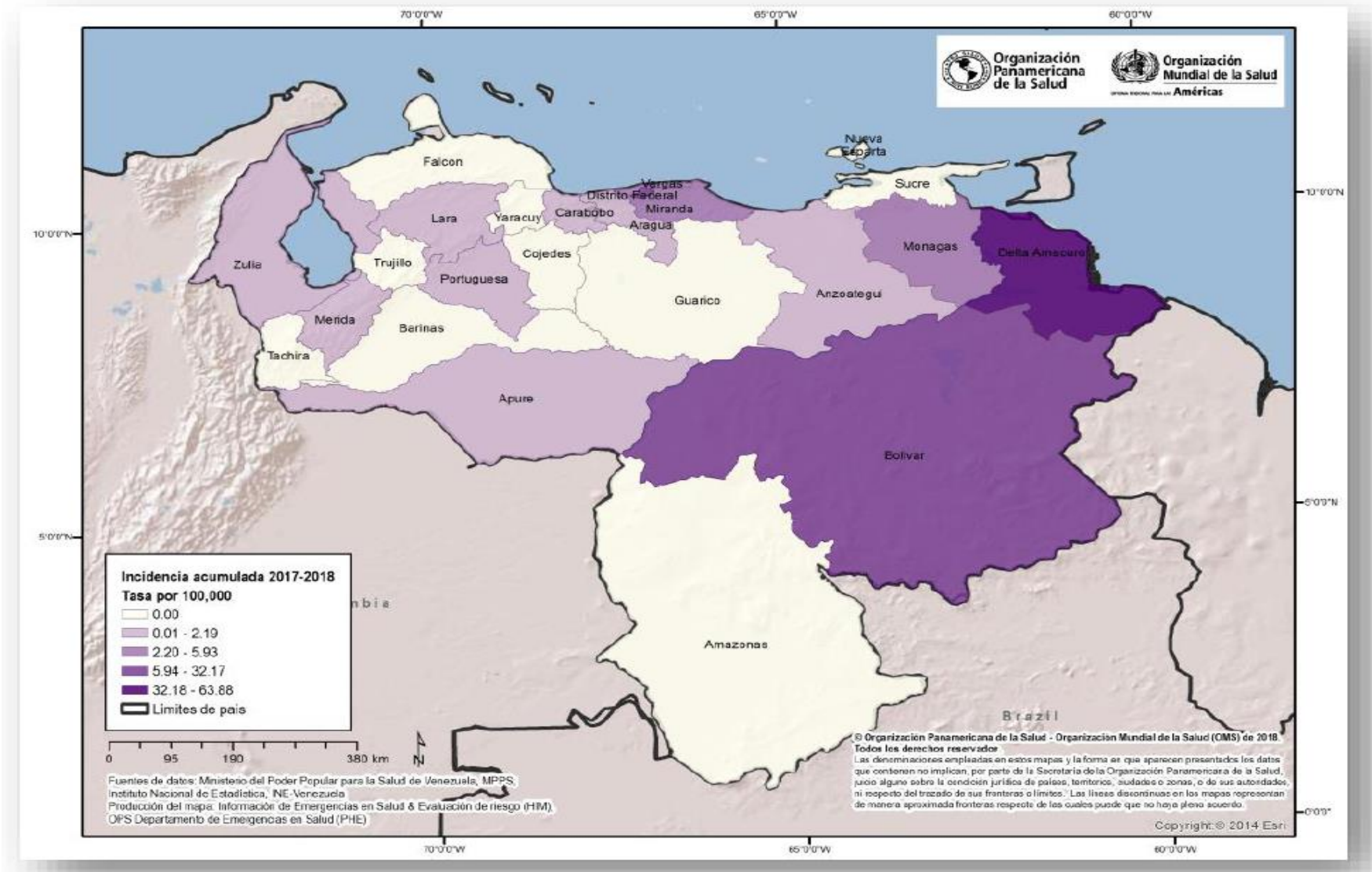
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Measles epidemiological situation in Venezuela, 2017 - 2018

- 15 year without endemic cases
- Index case detected at Caroní, Bolívar with DRO: July 1, 2017
- 10 months of viral circulation
- 2 deaths in children Bolívar.
- Genotype D8, imported from other regions of the world.
- No source of infection was identified

Tasa de incidencia de casos confirmados de sarampión por 100,000 habitantes
SE 1 - SE 49 del 2017

- 0.00 - 0.20
- 0.21 - 1.88
- 1.89 - 6.65
- 6.66 - 28.45
- Estados
- Límites de país

Distribution of measles cases in Venezuela.EW-16 2018

Incidence rate and percentage of cases by age group. Venezuela, 2017-2018*
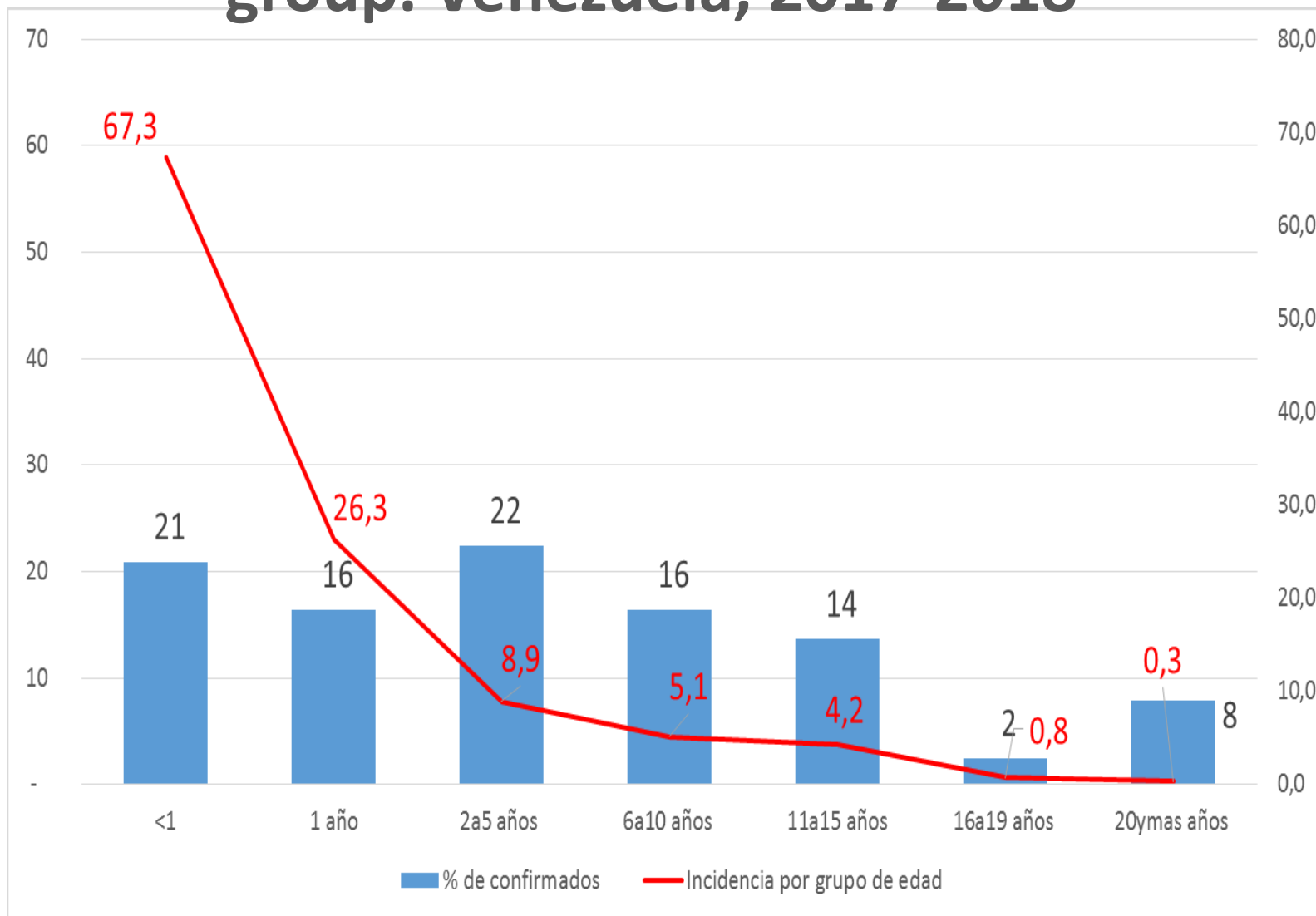
Distribution of measles cases in Brazil EW-16 2018
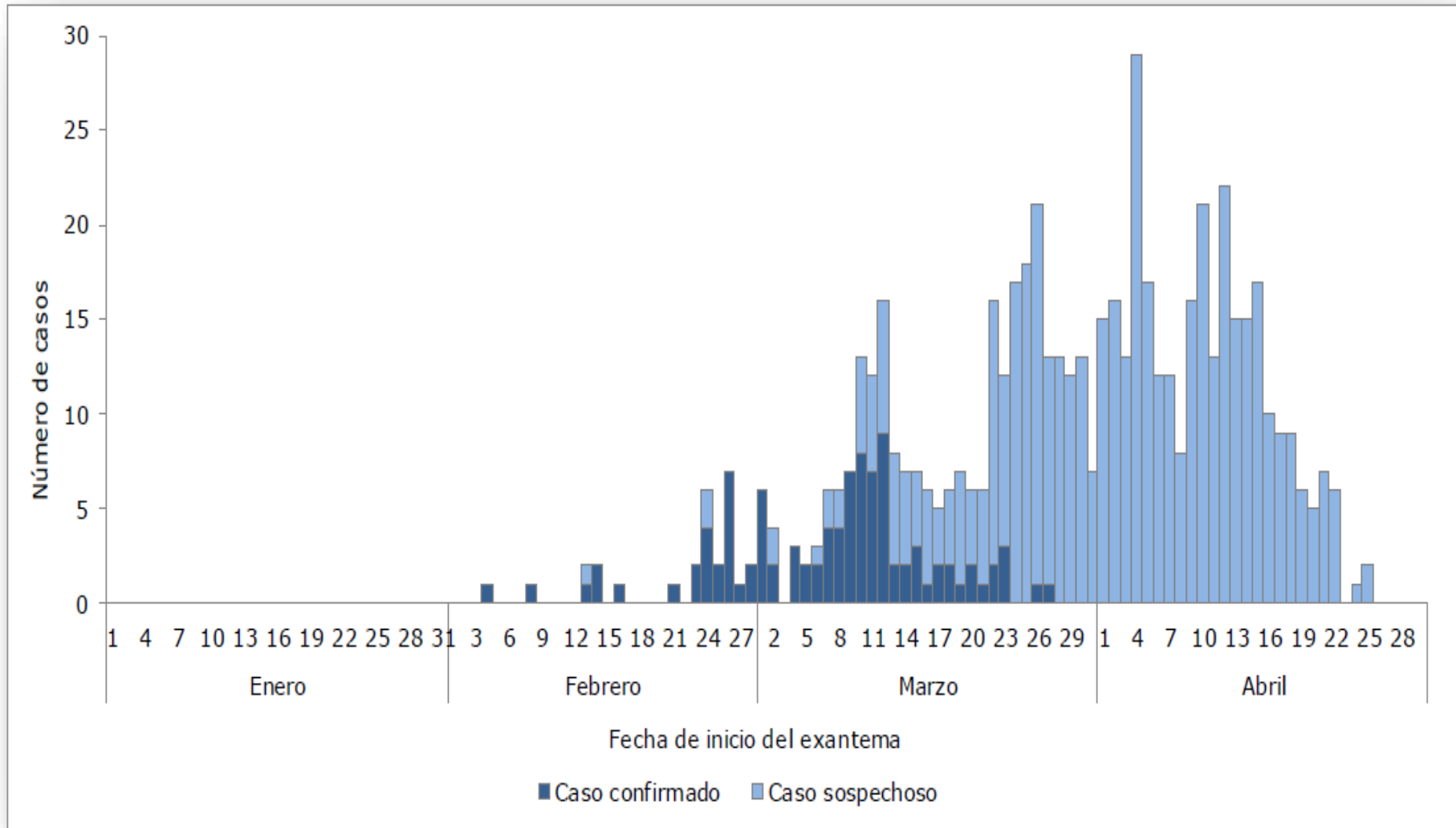
Resultados

Distribuição dos casos confirmados e em investigação de sarampo, por faixa etária e nacionalidade, Roraima, 2018

Faixa etária	Brasileiros				Venezuelanos			
	Confirmados[a] (24)		Em investigação[b] (111)		Confirmados[a] (55)		Em investigação[b] (99)	
	n	%	n	%	n	%	n	%
< 1	9	37,5	36	32,4	10	18,2	23	23,2
1 - 4	5	20,8	41	36,9	14	25,5	25	25,3
5 - 9	1	4,2	4	3,6	15	27,3	20	20,2
10 - 14	-	-	3	2,7	6	10,9	11	11,1
15 - 19	3	13	10	9,0	3	5,5	2	2,0
20 - 29	2	8,3	4	3,6	7	12,7	11	11,1
30 - 39	4	16,7	7	6,3	-	-	5	5,1
40 - 49	-	-	5	4,5	-	-	1	1,0
50 - 59	-	-	1	0,9	-	-	1	1,0
≥ 60	-	-	-	-	-	-	-	-

Mediana 12 anos (3 meses a 35 anos)

Não foram contabilizados na análise: [a]01 caso de nacionalidade da Guiana Inglesa; [b]01 caso de nacionalidade da Guiana Inglesa e 05 casos sem informação.

BRAZIL: Vaccination campaign to halt measles outbreak
GOAL: 400,000 individuals aged 6mo-59yr in 15 municipalities, March-April, 2018

Challenges in vaccination coverage

1   Improve national MMR1 and MMR2 vaccination coverage.

2   Increase homogeneity at the municipality level to reach the goal of =>95%.

3   Improve data quality of vaccination coverage at the municipality level.
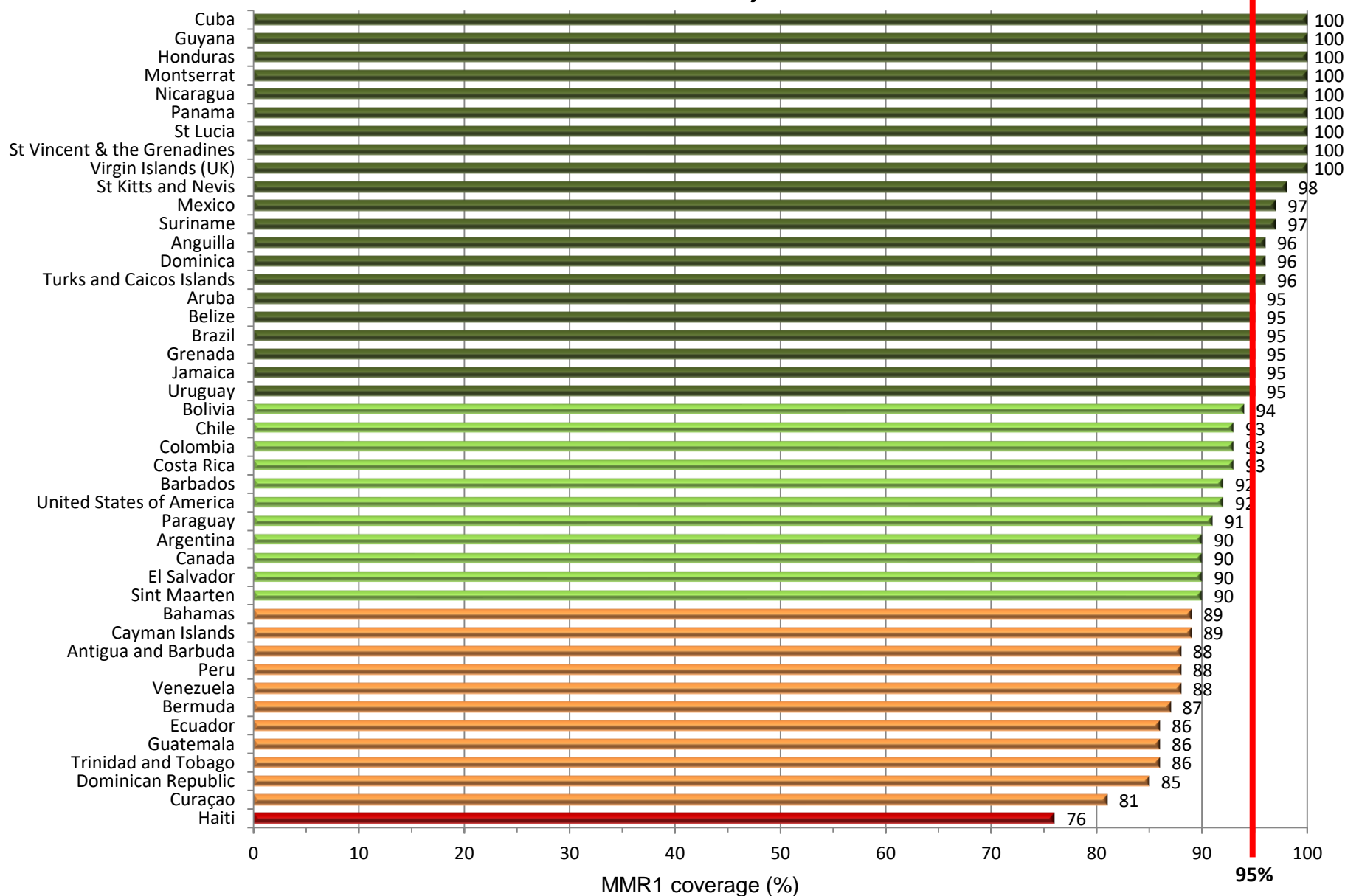
4   Push forward to nominal immunization registry.

5   Implement high-quality follow up campaigns.

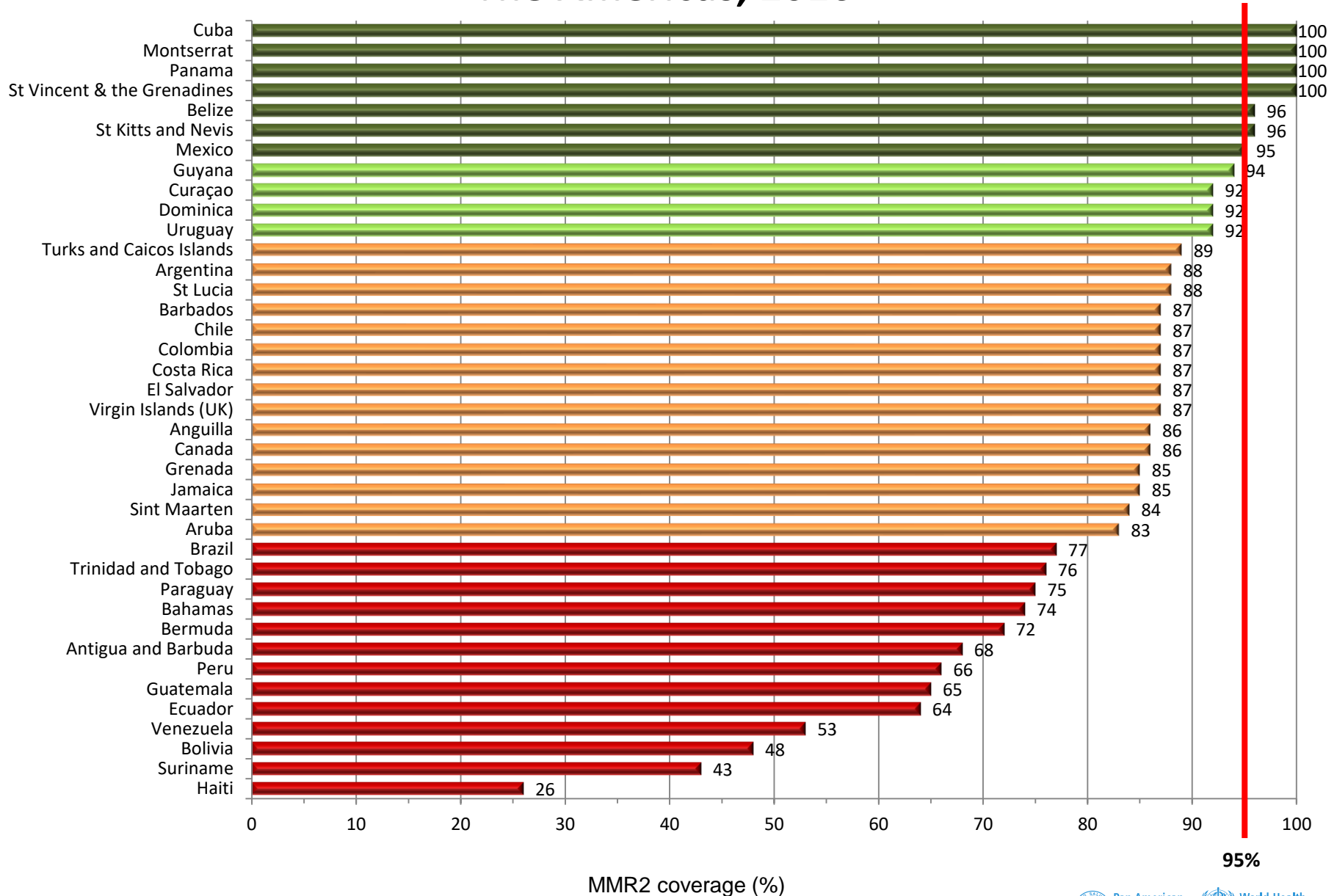# MMR1 vaccination coverage in children 1 year of age
The Americas, 2016

Country	MMR1 coverage (%)
Cuba	100
Guyana	100
Honduras	100
Montserrat	100
Nicaragua	100
Panama	100
St Lucia	100
St Vincent & the Grenadines	100
Virgin Islands (UK)	100
St Kitts and Nevis	98
Mexico	97
Suriname	97
Anguilla	96
Dominica	96
Turks and Caicos Islands	96
Aruba	95
Belize	95
Brazil	95
Grenada	95
Jamaica	95
Uruguay	95
Bolivia	94
Chile	93
Colombia	93
Costa Rica	93
Barbados	92
United States of America	92
Paraguay	91
Argentina	90
Canada	90
El Salvador	90
Sint Maarten	90
Bahamas	89
Cayman Islands	89
Antigua and Barbuda	88
Peru	88
Venezuela	88
Bermuda	87
Ecuador	86
Guatemala	86
Trinidad and Tobago	86
Dominican Republic	85
Curaçao	81
Haiti	76

MMR1 coverage (%)

95%

MMR2 vaccination coverage in children
The Americas, 2016

Country	MMR2 coverage (%)
Cuba	100
Montserrat	100
Panama	100
St Vincent & the Grenadines	100
Belize	96
St Kitts and Nevis	96
Mexico	95
Guyana	94
Curaçao	92
Dominica	92
Uruguay	92
Turks and Caicos Islands	89
Argentina	88
St Lucia	88
Barbados	87
Chile	87
Colombia	87
Costa Rica	87
El Salvador	87
Virgin Islands (UK)	87
Anguilla	86
Canada	86
Grenada	85
Jamaica	85
Sint Maarten	84
Aruba	83
Brazil	77
Trinidad and Tobago	76
Paraguay	75
Bahamas	74
Bermuda	72
Antigua and Barbuda	68
Peru	66
Guatemala	65
Ecuador	64
Venezuela	53
Bolivia	48
Suriname	43
Haiti	26

95%

MMR2 coverage (%)

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Proportion of municipalities with different MMR1 coverage levels in children 1 year* of age. Latin America and the Caribbean, 2006-2016
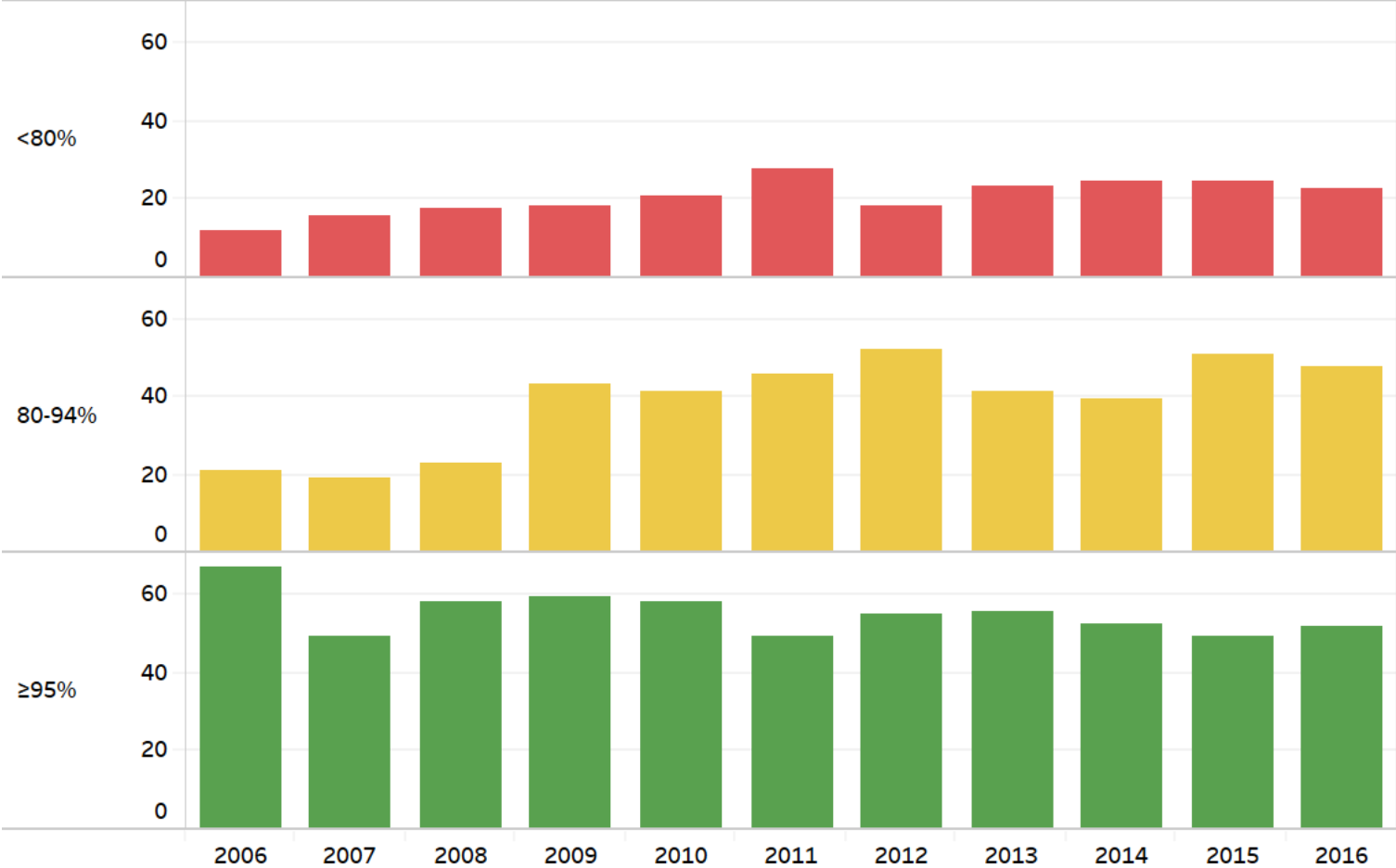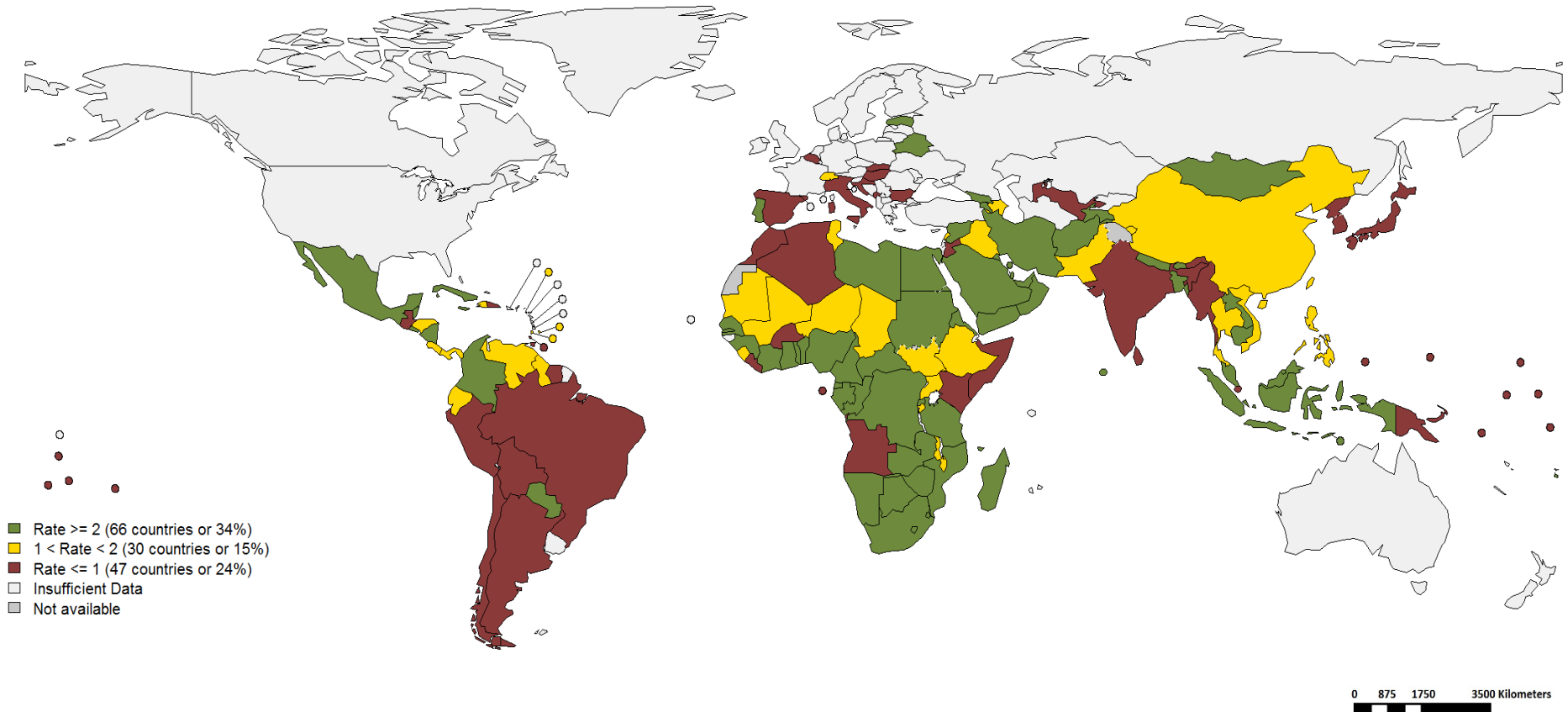
Challenges in epidemiological surveillance

Improve detection:

- Virus importations from other regions of the world

- Arboviruses diseases in the Americas

- Use of sensitive and specific case definitions

- Health care workers do not recognize clinical aspects of measles, rubella and CRS

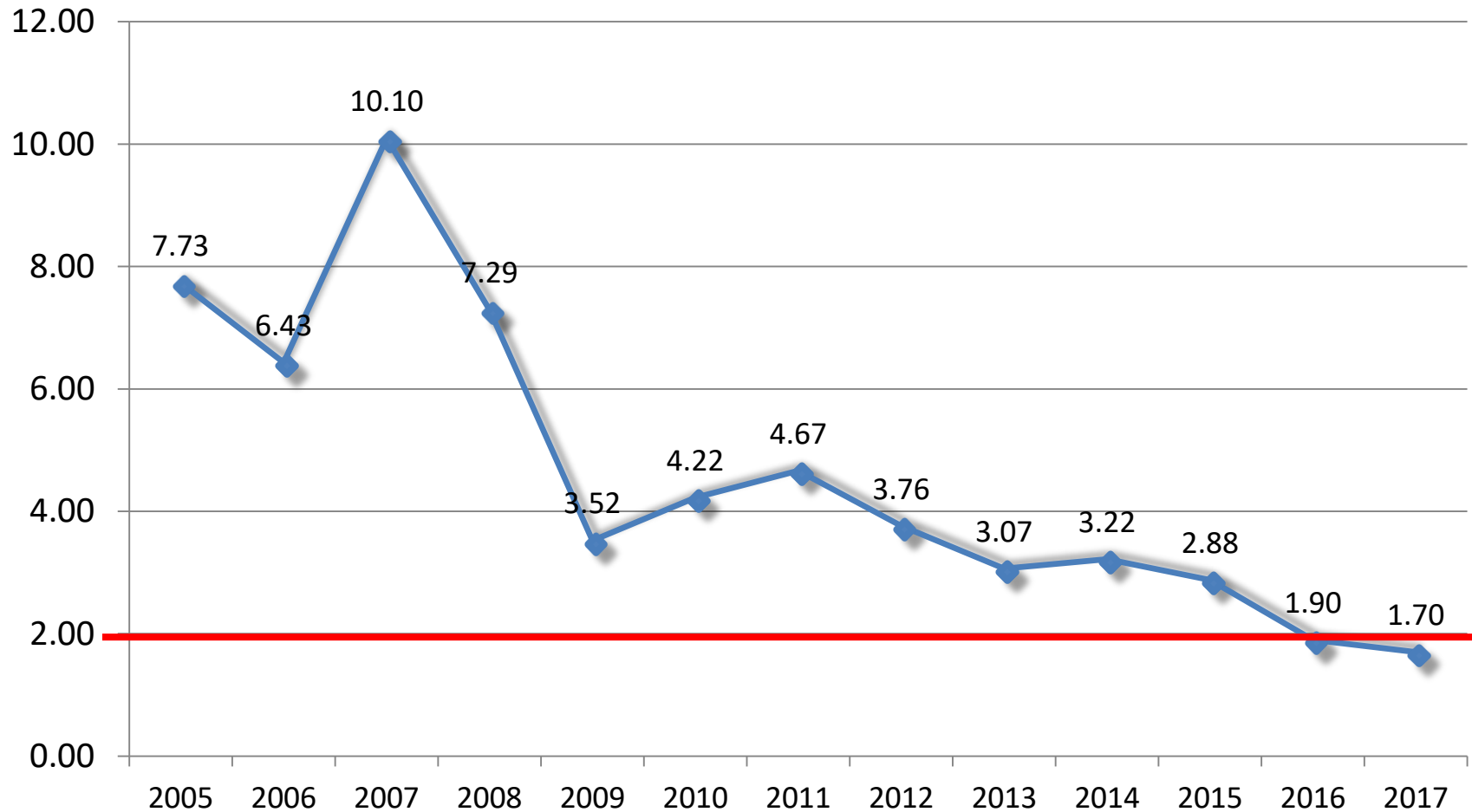# Rate of suspected measles and rubella cases per 100,000 habitants, 2017.

Rate >= 2 (66 countries or 34%)
1 < Rate < 2 (30 countries or 15%)
Rate <= 1 (47 countries or 24%)
Insufficient Data
Not available

0   875   1750   3500 Kilometers

- Based on data received 2018-02 and covering the period between 2017-01 and 2017-12 - Target: >= 2 discarded cases* / 100,000 population** - * Suspected cases investigated and discarded as non-measles non-rubella using laboratory testing and/or epidemiological linkage to another etiology ** World population prospects, 2017 revision

Regional rate of suspected measles and rubella cases
Latin America and the Caribbean, 2005-2017

Year	Rate
2005	7.73
2006	6.43
2007	10.10
2008	7.29
2009	3.52
2010	4.22
2011	4.67
2012	3.76
2013	3.07
2014	3.22
2015	2.88
2016	1.90
2017	1.70

Sources: Surveillance country reports sent to the Immunization Unit of PAHO/WHO

Notification of suspected measles and rubella cases, Latin America and the Caribbean, epidemiological weeks 1-16 of 2017 and 2018*
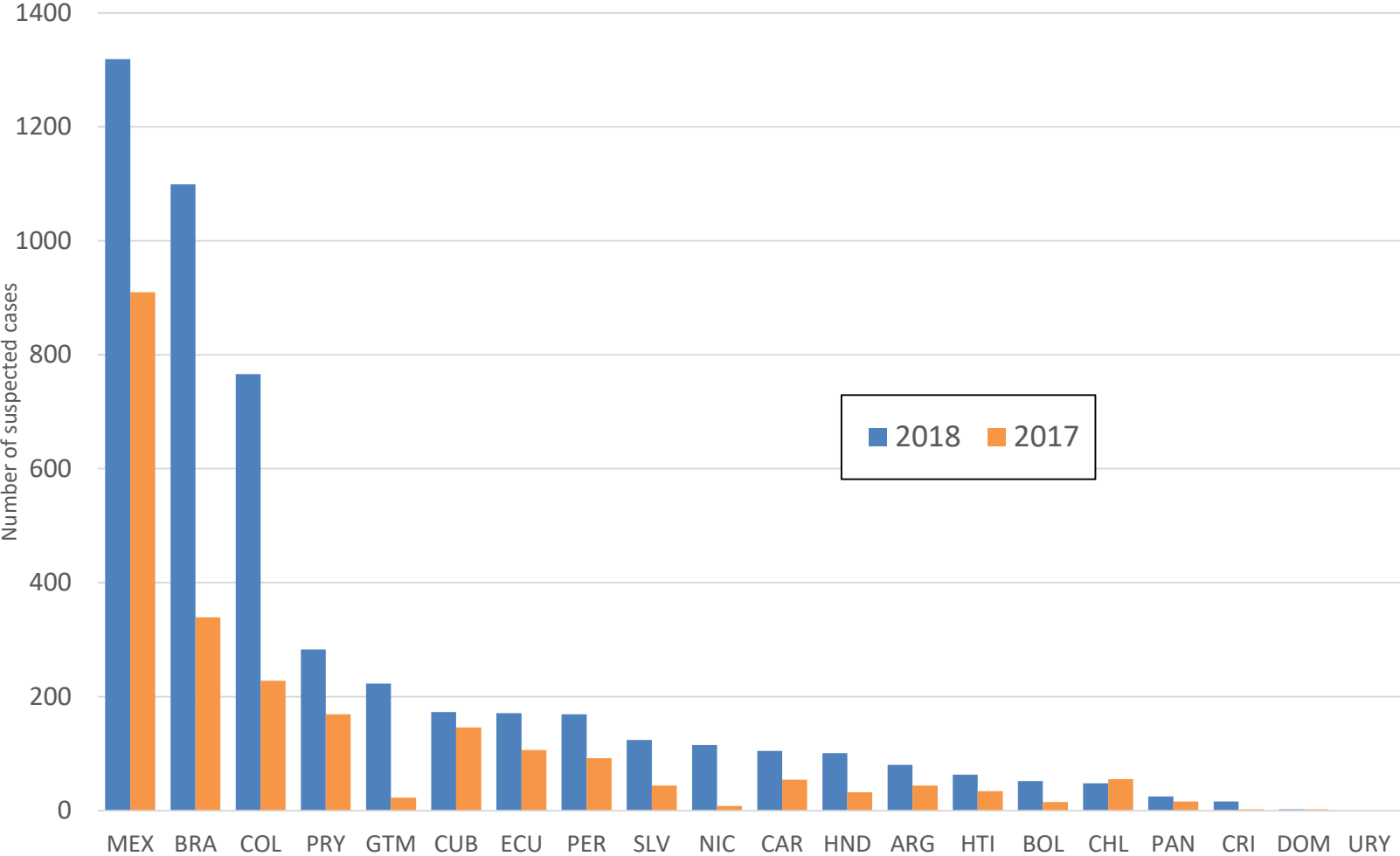
Source: MESS, ISIS, and country reports sent to FPL-IM
*Data as of epidemiological week 16, 2018.

Challenges in rapid response

1 Rapid Response teams activated at national and subnational level

2 HCW training for rapid detection and investigation.

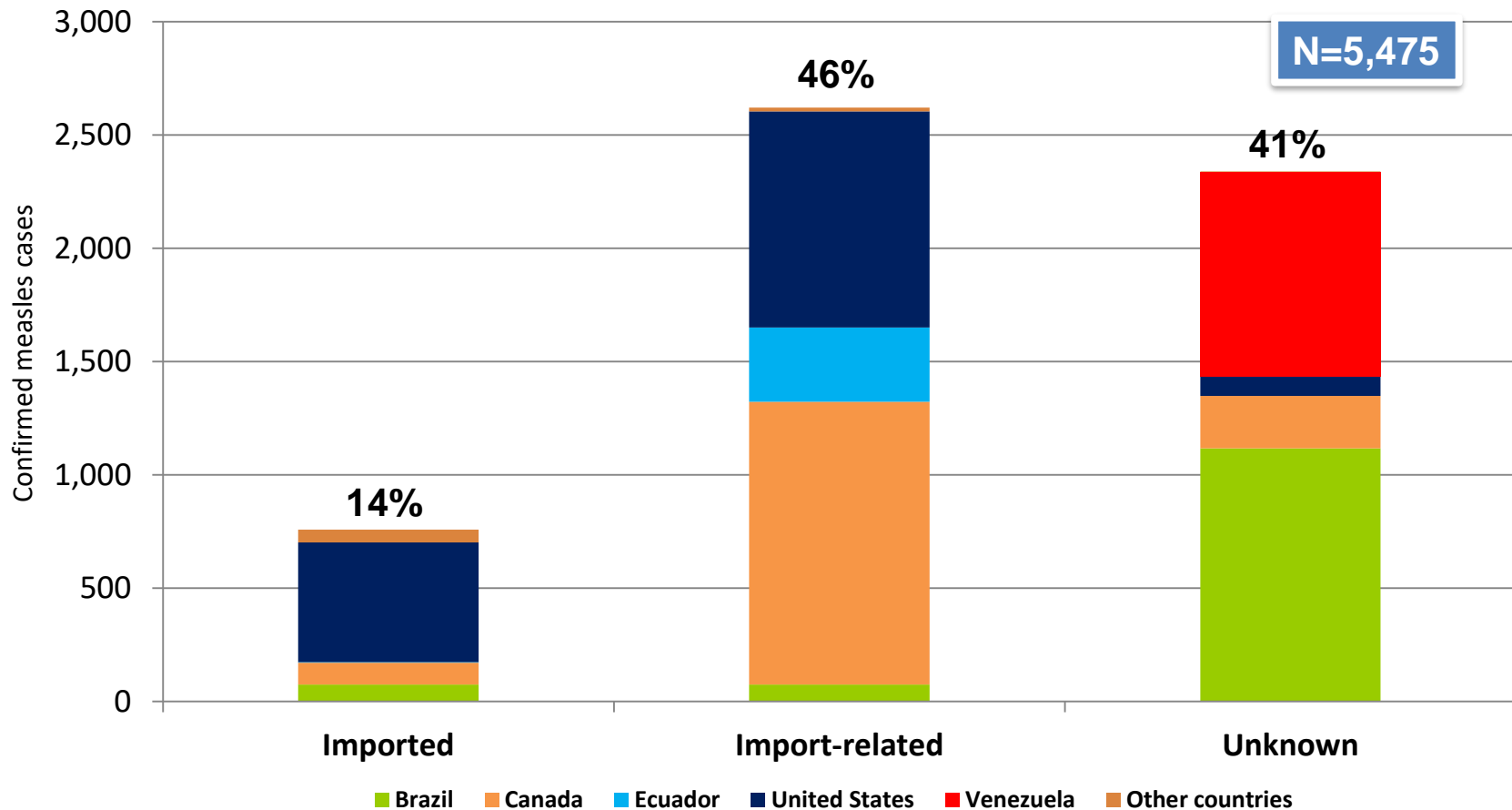**3** Cases and contacts tracing to stop transmission.

4 Health services organized for triage and isolation of measles highly suspected cases.

5 Vaccination activities have to be done to prevent the virus, not to go beyond it.

Confirmed measles cases following source of infection The Americas, 2011-2018*

Source: MESS, ISIS, and country reports sent to FPL-IM
*Data as of epidemiological week 18, 2018.

PAHO Regional Meeting and Rapid Response to Measles Imported Cases Workshops

Reunión de sostenibilidad de la eliminación del sarampión, la rubéola y el síndrome de la rubéola congénita
Panamá, 3-5 de abril de 2017

- **2017:**
- Regional Meeting and two Sub regional Workshops for rapid Response to measles imported cases.
- **2018:**
- 7 National workshops in 6 countries: DOR, CUB, GUT, PER, BOL, ECU.
- **July/August 2018:**
- 1 Sub Regional English Caribbean
- 1 National: HON

Detecting suspect measles/rubella cases

¿Dónde y de quién se ha contagiado?

- Identificación del periodo de exposición/incubación
- Contactos directos e indirectos
- Lugares visitados
- Transporte utilizado

Periodo de exposición/incubación
7 a 21 días entre la exposición y inicio de exantema

¿A quién y dónde contagió?

- Identificación del periodo de transmisibilidad
- Contactos directos e indirectos
- Identificación de las rutas del caso
- Lugares visitados
- Transporte utilizado

Periodo de transmisibilidad
4 días antes y 4 después de inicio de exantema

¿Cómo identificar los casos secundarios?

- Identificación del periodo de aparición de casos secundarios del caso índice
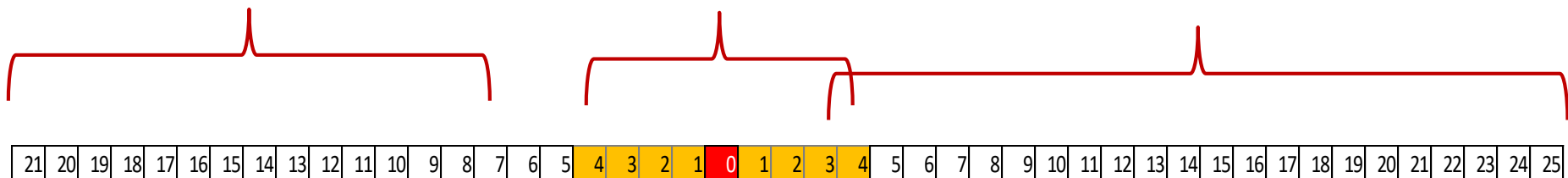- Seguimiento de todos los contactos que presenten fiebre y erupción

Periodo de aparición de casos secundarios
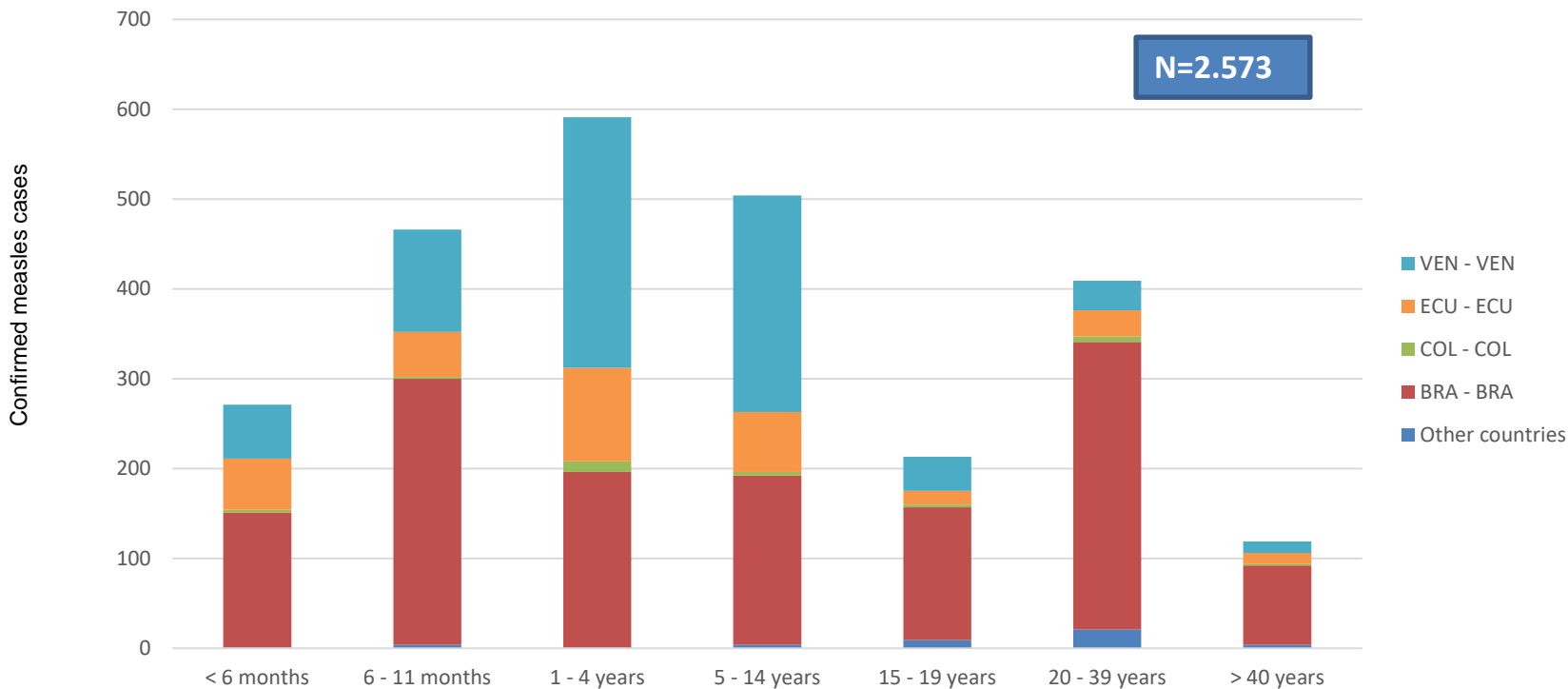7 días después del primer día del periodo de transmisibilidad hasta 21 días después del último día del periodo de transmisibilidad

| 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |

Case and contact tracing to stop measles virus transmission
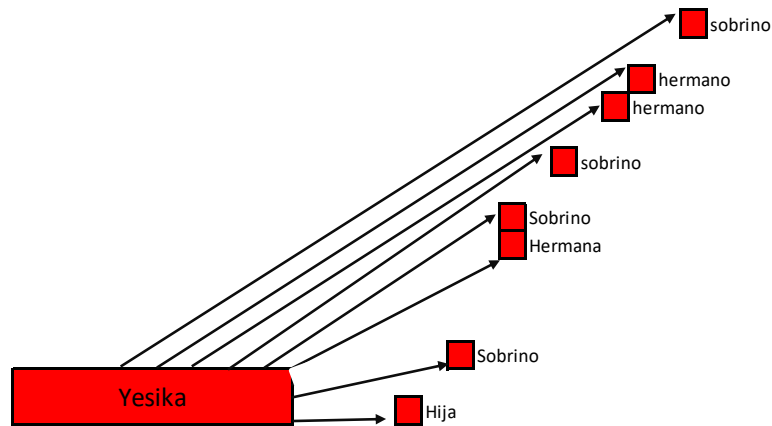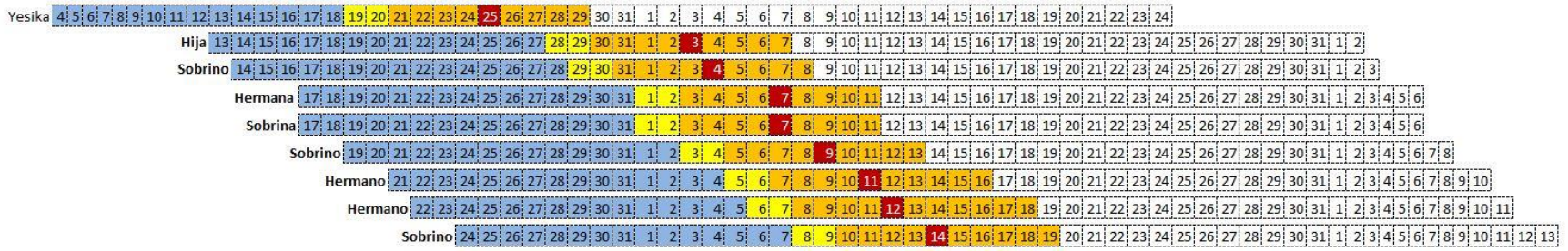
**Distribution of confirmed measles cases by country
Latin America and the Caribbean, 2013-2018***

N=2.573

Confirmed measles cases

700
600
500
400
300
200
100
0

< 6 months | 6 - 11 months | 1 - 4 years | 5 - 14 years | 15 - 19 years | 20 - 39 years | > 40 years

- VEN - VEN
- ECU - ECU
- COL - COL
- BRA - BRA
- Other countries

Sources: Surveillance country reports sent to the Immunization Unit of PAHO/WHO
 *Data as of epidemiological week 18, 2018.

Diferencias clínicas entre el sarampión, la rubéola y algunas arbovirosis

Signos y síntomas	Dengue	Chikingunya	Zika	Sarampión	Rubéola [c]
Fiebre	Indispensable	Indispensable	Puede aparecer	Indispensable	Indispensable
Exantema maculopapular	Frecuente	Frecuente	Indispensable	Indispensable	Indispensable
Hiperemia conjuntival	Puede aparecer	Puede aparecer[d]	Frecuente	Frecuente	Puede aparecer
Mialgia	Frecuente	Frecuente	Puede aparecer	Ausente	Ausente
Artralgia y/o poliartralgia para arbovirosis	Frecuente	Indispensable	Frecuente	Ausente	Puede aparecer
Edema en manos y pies	Puede aparecer	Frecuente	Frecuente	Ausente	Ausente
Dolor retroocular	Frecuente	Puede aparecer	Ausente	Ausente	Ausente
Linfadenopatía	Ausente	Puede aparecer Retro auricular	Puede aparecer Retro auricular	Ausente	Frecuente
Tos	Ausente	Ausente	Ausente	Frecuente	Ausente
Coriza	Ausente	Ausente	Ausente	Frecuente	Puede aparecer
Hemorragia	Puede aparecer [e]	Ausente	Ausente	Ausente	Ausente
Leucopenia	Frecuente	Puede aparecer	Puede aparecer	Puede aparecer	Puede aparecer

Maculopapular rash due to Zika virus infection

Photo credit: Health Secretariat of Ceará, Brazil

Outline

❖ Global measles situation
❖ Main challenges of post-elimination era in the Americas
❖ **Conclusions**
❖ **Next steps**

Conclusions

❖ **Risk: Import and reestablish endemic transmission of measles and rubella virus, losing the elimination gains.**

❖ **Challenge: Maintain the adequate equilibrium towards the fulfillment of three key strategies:**

1. Guarantee high (=> 95%) and homogeneous coverage with two doses of MMR vaccine, in each district or municipality.

2. Guarantee a high quality surveillance system, with the ability to detect any suspected case of measles, rubella and CRS in a timely manner.

3. Implement a rapid response to imported cases of measles, rubella and CRS, following standardized mechanisms to prevent the reestablishment of endemic transmission.
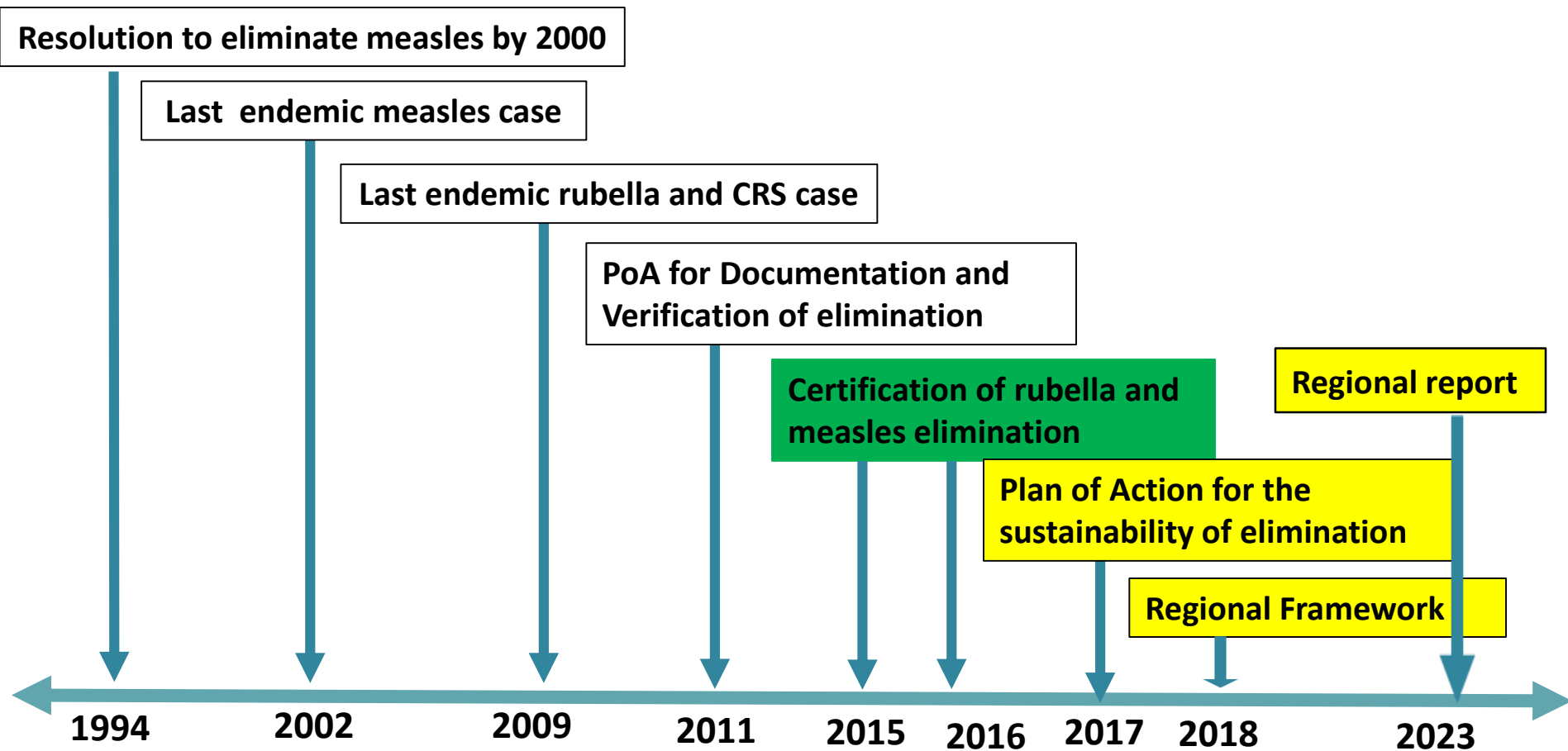
Outline

❖ Global measles situation
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TAG Working Group: Sustainability of Elimination

- Monitoring the sustainability of the elimination by tracking progress towards the fulfillment of the objectives and indicators of the plan of action.

- Developing a **regional framework**, with new rules of the game, and the actions to take in the event of the reestablishment of endemic transmission.

Roadmap for monitoring sustainability of measles, rubella and CRS elimination in the Americas, 1994-2023.

Resolution to eliminate measles by 2000

Last endemic measles case

Last endemic rubella and CRS case

PoA for Documentation and Verification of elimination

Certification of rubella and measles elimination

Regional report

Plan of Action for the sustainability of elimination

Regional Framework

1994   2002   2009   2011   2015   2016   2017   2018   2023

Ministries of Health of the Americas pledge action to keep the region free of measles and rubella

During the 29th Pan American Sanitary Conference, Ministers of health from the countries of the Americas approved a plan to keep the region free of measles, rubella, and congenital rubella syndrome (CRS) for the period 2018-2023. This plan of action lays out four strategic lines of action to follow in order to sustain the elimination: guarantee universal access to measles and rubella vaccination services; strengthen the capacity of epidemiological surveillance; develop national operational capacities to maintain the elimination; and establish standard mechanisms for rapid response to imported cases.
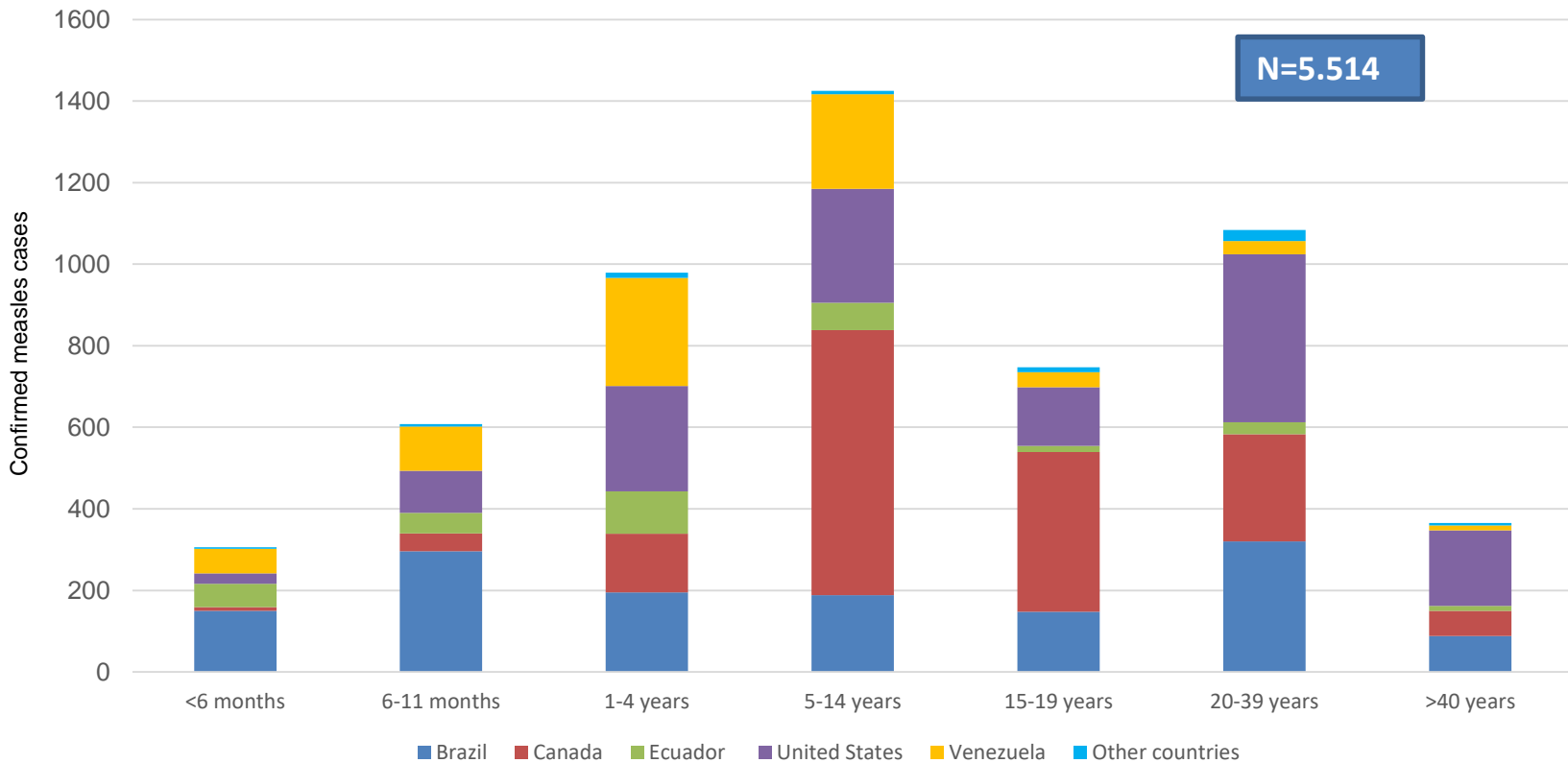
Gracias!
Thanks!

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Distribution of confirmed measles cases by country The Americas, 2011-2018*

N=5.514

Confirmed measles cases

Legend: Brazil, Canada, Ecuador, United States, Venezuela, Other countries

Sources: Surveillance country reports sent to the Immunization Unit of PAHO/WHO
*Data as of epidemiological week 18, 2018.