Seasonal influenza vaccination in the Americas: update on current policies, use and progress in estimating vaccine effectiveness

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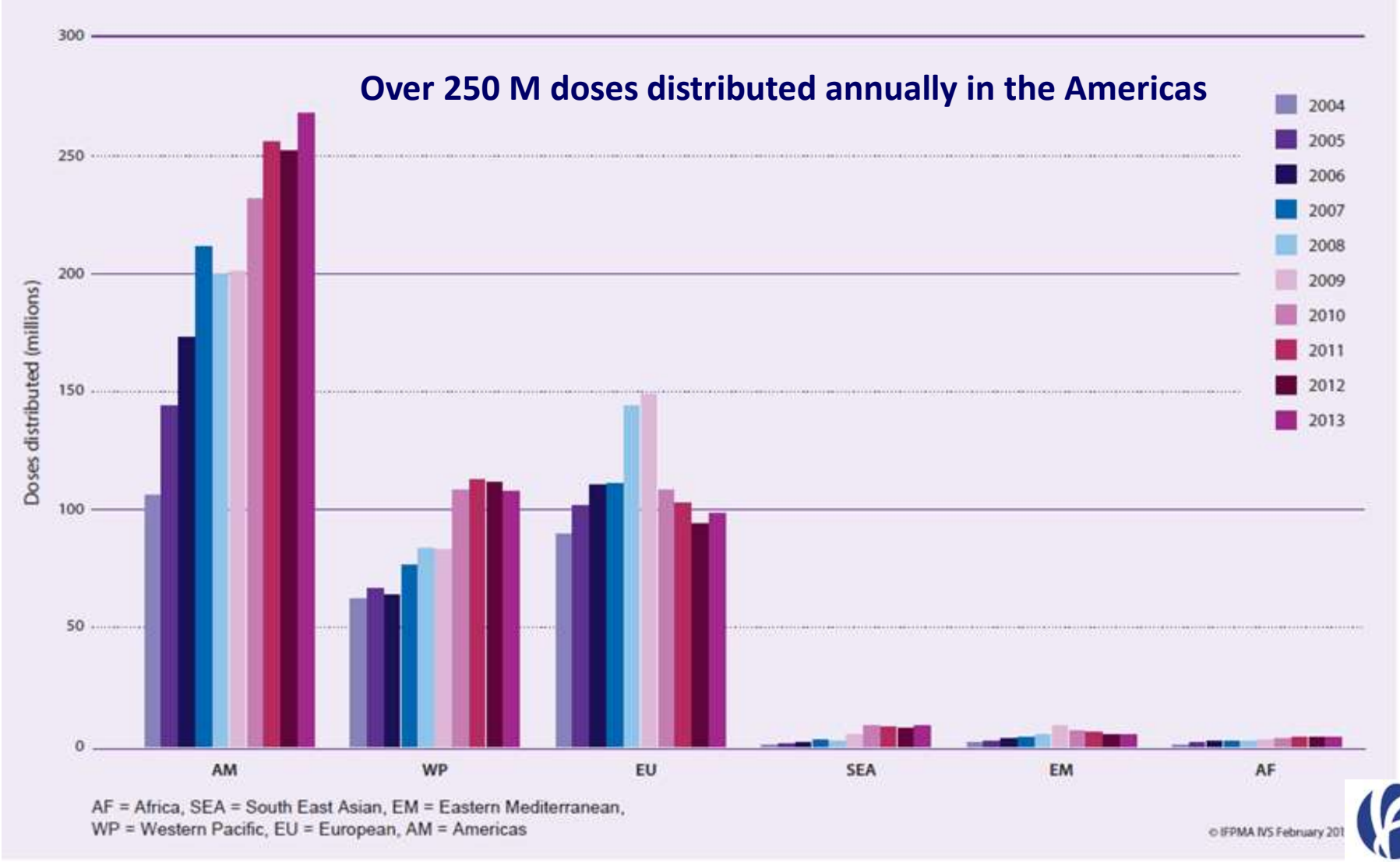
Red para la **E**valuación de **V**acunas **E**n **L**atino **A**mérica y el **C**aribe – ***i****nfluenza*

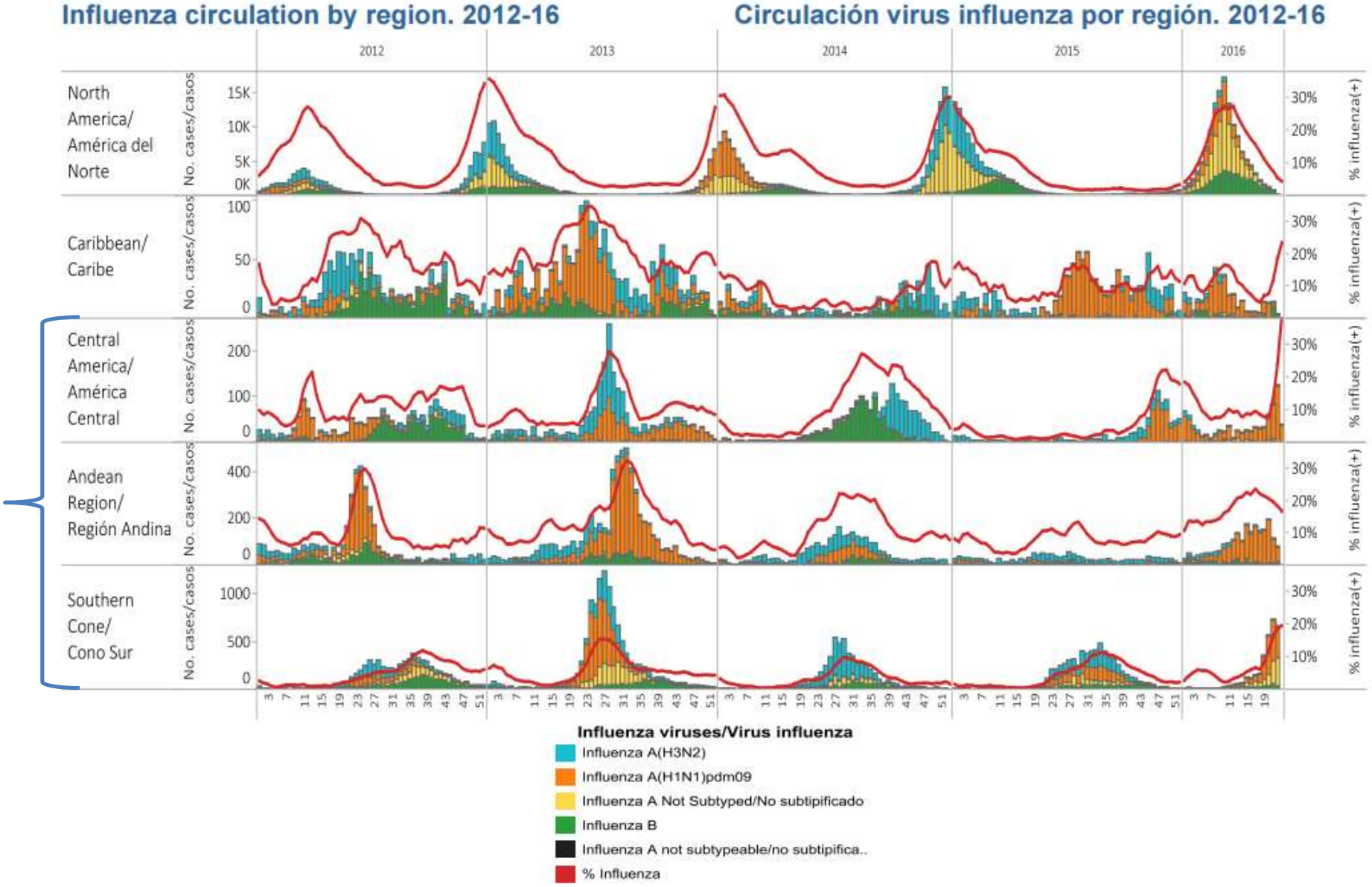
Countries and Territories in the Americas with Policies for seasonal influenza vaccination, 2004-16

Number (%) of countries that have:	2004	2008	2016
Policies for influenza vaccination	**13**	**35**	**40/52 (77%)**
Vaccination of healthy children	6	22	25 *(48%)*
Vaccination of children with chronic diseases			5 *(9%)*
Vaccination of the elderly	12	33	39 *(75%)*
Vaccination of persons with chronic diseases	9	24	35 *(67%)*
Vaccination of health care workers	3	32	38 *(73%)*
Vaccination of pregnant women	3	7	31 *(60%)*

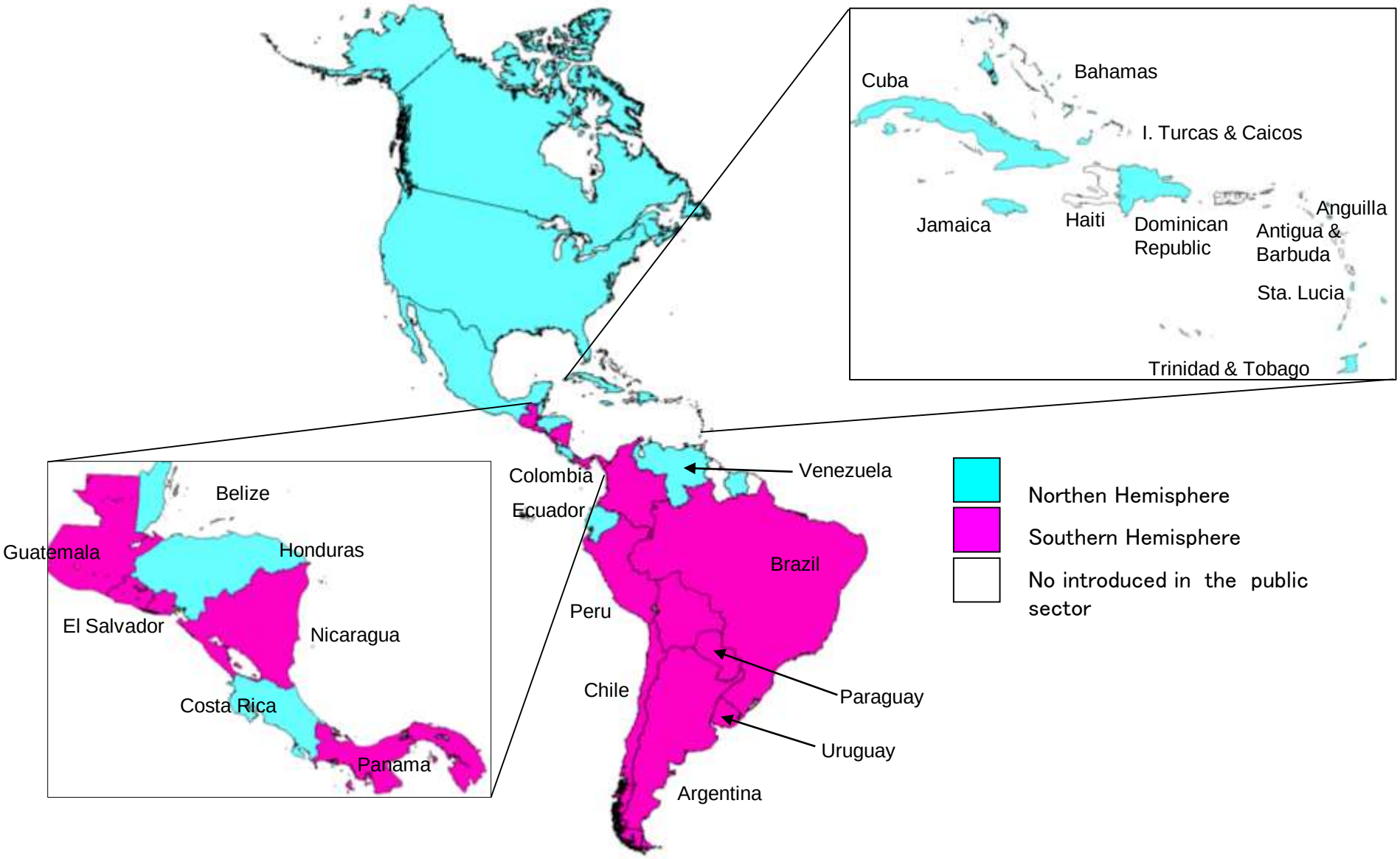
Distribution of influenza vaccines per WHO region, 2004-13



International Federation of Pharmaceutical Manufacturers (IFPMA)

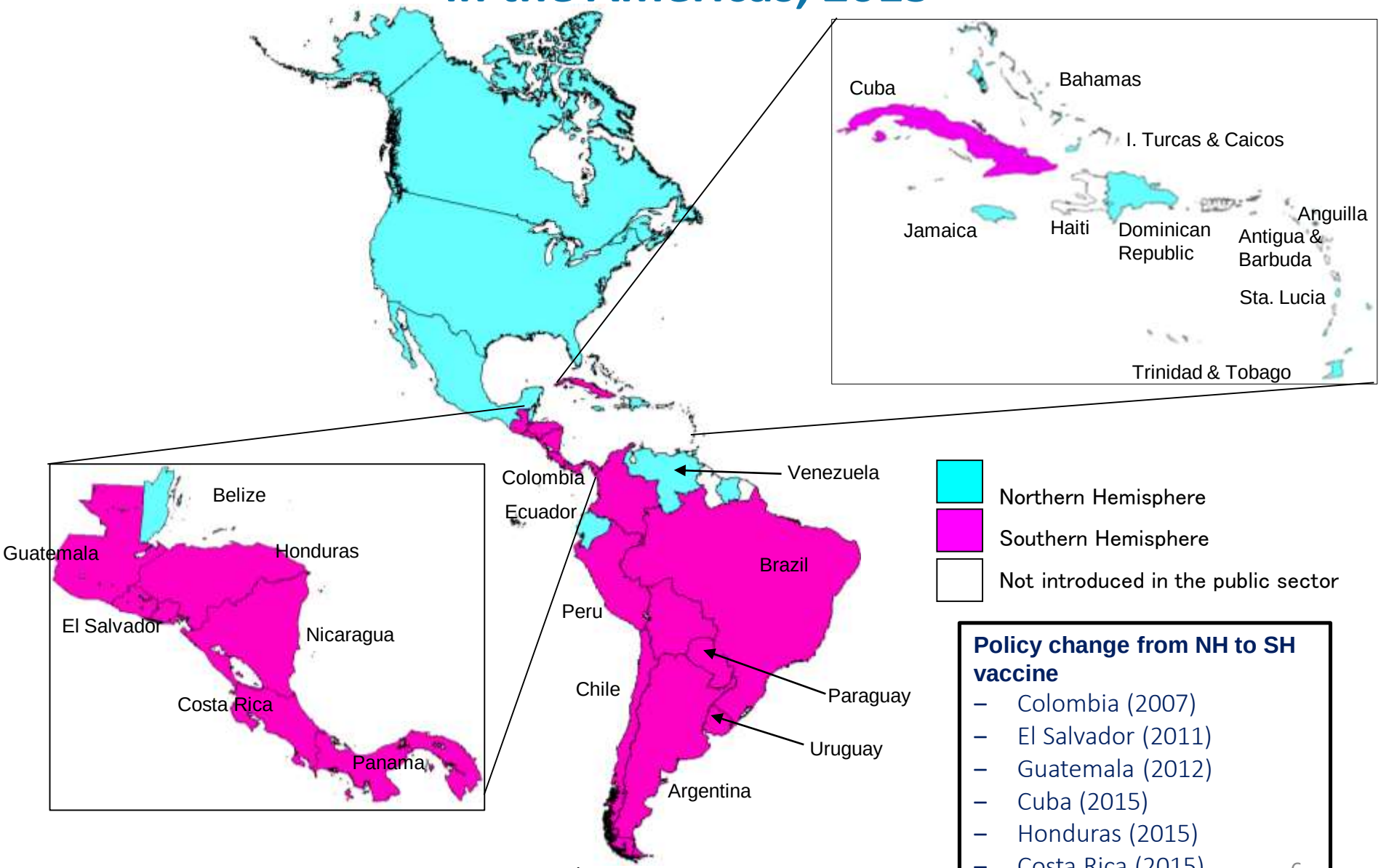

Influenza circulation by region. 2012-16
Circulación virus influenza por región. 2012-16
2012
2013
2014
2015
2016
North America/ América del Norte
Caribbean/ Caribe
Central America/ América Central
Andean Region/ Región Andina
Southern Cone/ Cono Sur
No. cases/casos
% influenza(+)
Influenza viruses/Virus influenza
Influenza A(H3N2)
Influenza A(H1N1)pdm09
Influenza A Not Subtyped/No subtipificado
Influenza B
Influenza A not subtypeable/no subtipifica..
% Influenza

Use of seasonal influenza vaccine & formulation in the Americas, 2014



Source: Country reports to PAHO, MOHs Webpage, PAHO/WHO Surveys

Use and formulation of seasonal influenza vaccines in the Americas, 2015

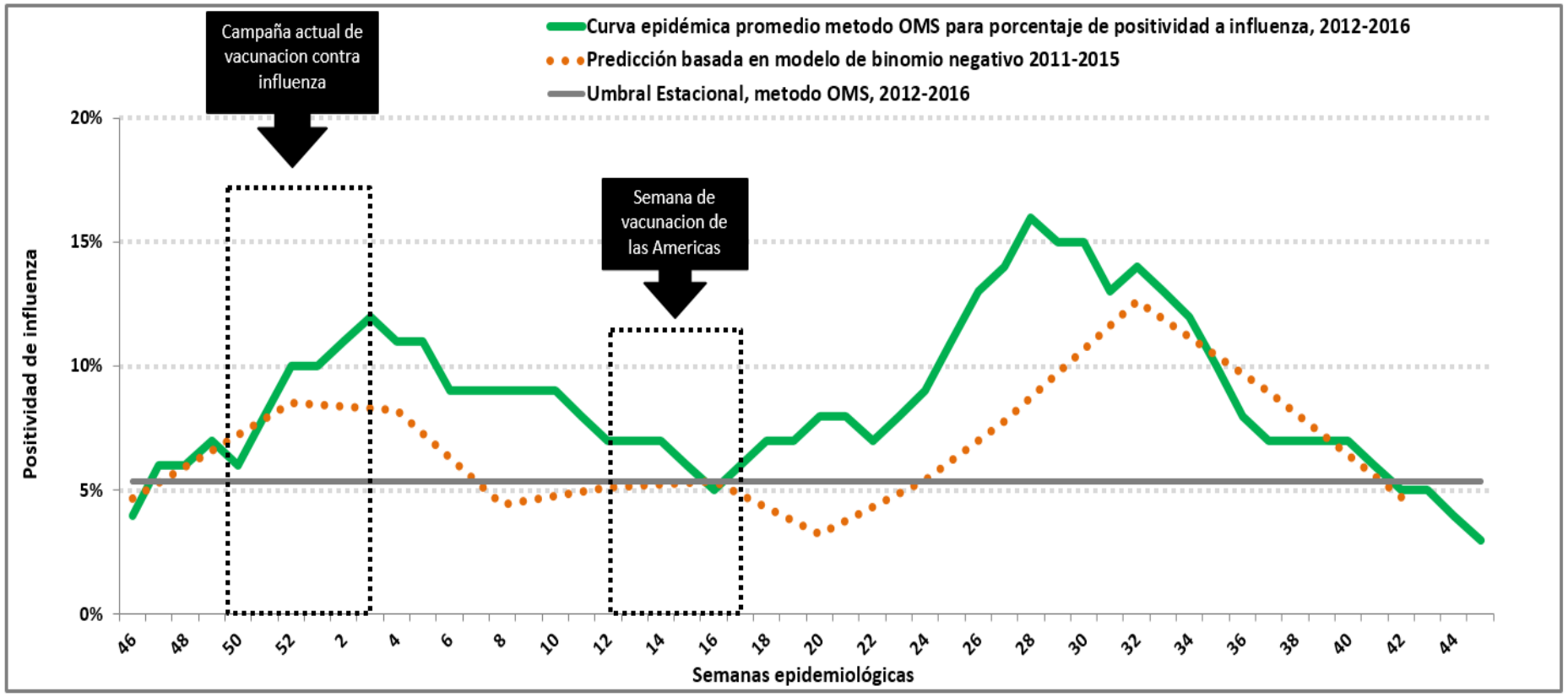


Policy change from NH to SH vaccine

- Colombia (2007)
- El Salvador (2011)
- Guatemala (2012)
- Cuba (2015)
- Honduras (2015)
- Costa Rica (2015)

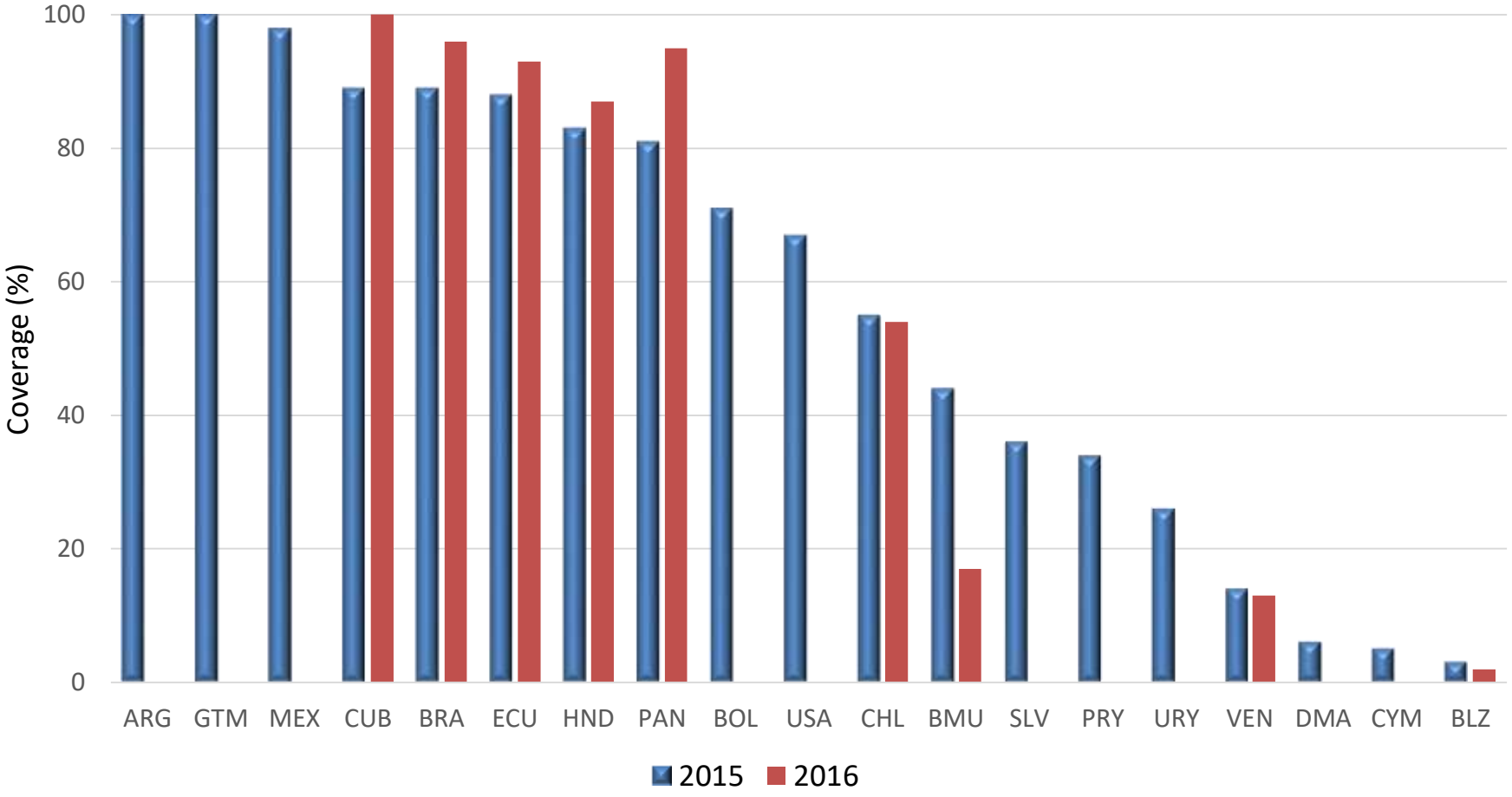
Source: Country reports to PAHO, MOHs Webpage, PAHO/WHO Surveys

Seasonality of influenza and vaccination, Ecuador 2011-16 (n=2,075)



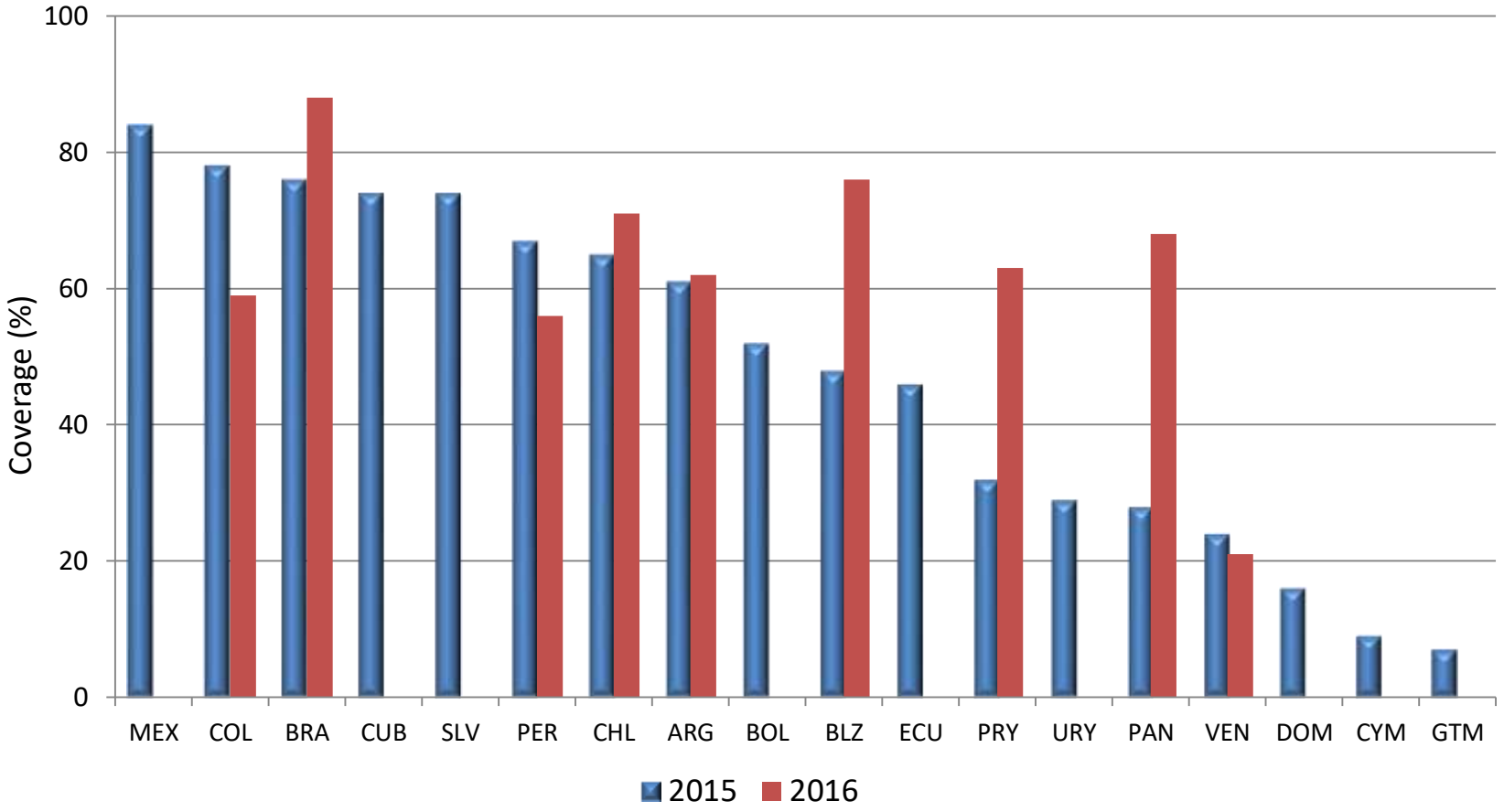
Fuente: Ecuador. Vigilancia centinela de IRAG, datos virológicos reportados a FluNet 2011-2016.

Influenza vaccine coverage among the elderly Latin America and the Caribbean, 2015 and 2016*



Source: Country reports through the PAHO-WHO Joint Reporting Forms (JRF), 2016 and 2017.
* Provisional data

Influenza vaccine coverage among children less than 5 years old Latin America and the Caribbean, 2015-2016* (full vaccination only)



Source: Country reports through the PAHO-WHO Joint Reporting Forms (JRF), 2016 and 2017.
Note Pediatric coverage formula: ((2nd dose+single dose)/denominator)*100
* Provisional data

REVELAC-i network evolution

(Red para la Evaluación de Vacunas de Influenza en América Latina y el Caribe)

- **Multicenter case-control** study: to estimate VE against **PCR-confirmed influenza-associated SARI** among vaccination **target groups during the influenza season**

2012
Pilot phase
(4 SH)

2013
Implementation & network launch
(9 SH + 1 NH)

2014
(7 SH + pilot in Ecuador)

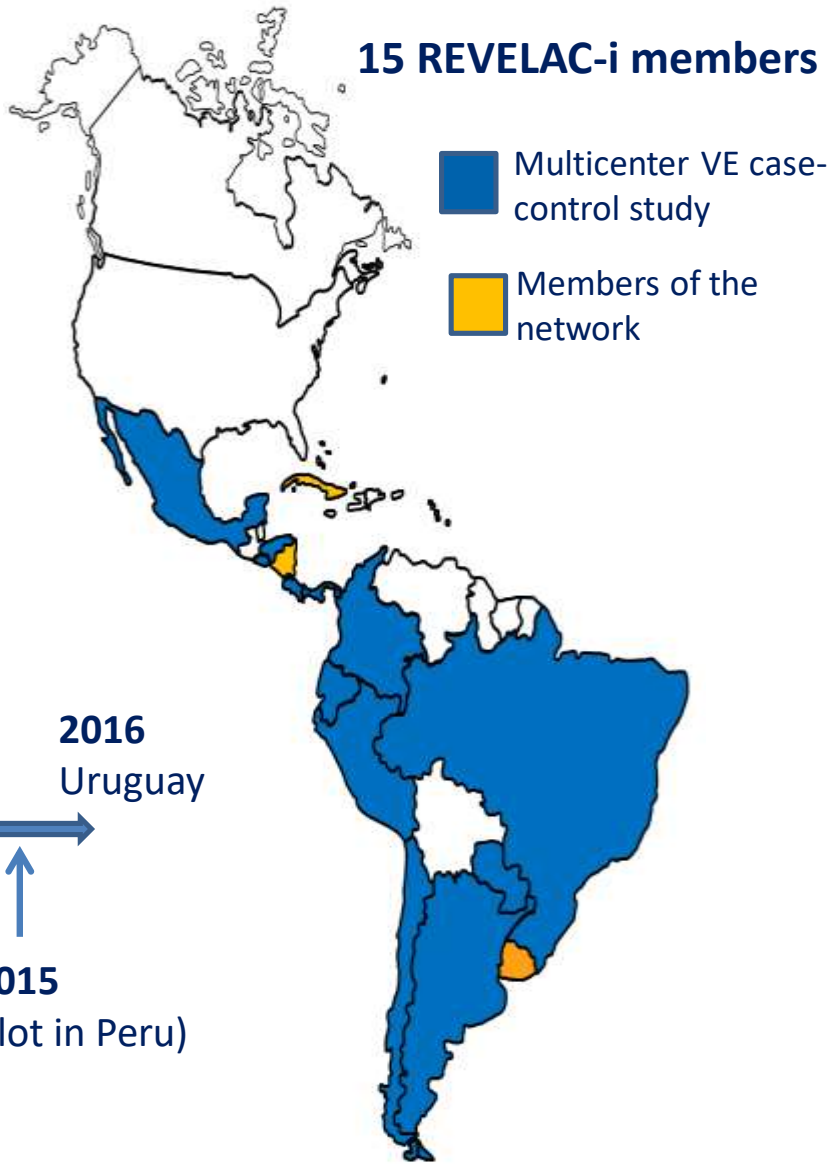
2015
(5 SH+ pilot in Peru)

2016
Uruguay

Costa Rica
El Salvador
Honduras
Panama

+ Argentina
Brazil
Chile
Colombia
Paraguay

+ México



Network for Evaluation of Influenza Vaccine Effectiveness in Latin America and the Caribbean

REVELAC-i

Objectives:

Estimate the effectiveness of influenza TIV in preventing severe acute respiratory infections (SARI) laboratory-confirmed for influenza among EPI target groups during influenza seasons.

SARInet

Building upon the existing regional SARI surveillance platform.

REVELAC-i

Using a common protocol, case-control (test-negative design).

RT-PCR laboratory confirmation for influenza.

Multidisciplinary efforts integrating influenza surveillance teams, refence laboratories and immunization programs

Revelac-i

Use of VE estimates in LAC

- Differences in use of VE between developed and developing countries
  - EPI provides vaccine free of charge and need to sustain investment in the vaccine (flu vaccine first target of budget cuts).
  - Show benefit of vaccination with current strategies as averted deaths and hospitalizations
- Not yet information for action, although REVELAC-i contributes to GIVE

Clinical, Epidemiological and Laboratory Investigation Form for Sentinel SARI Surveillance

Case Definition: An acute respiratory infection with history of fever or measured fever of ≥ 38C°, and cough, with onset within the last ten days, and requires hospitalization

1. CAPTURE

1. Today's Date: / / (Day/mon/year) 2. Case Code: 3. Establishment Name:

4. Clinical History Number: 5. Capture Date: / / (Day /mon/year)

6. Patient Name: (First Last Name / Second Last Name / First Name / Second Name)

7. ID #: 8. Birth Date: __/__/__ (Day /mon/year) 9. Age: _____ Years _____ Months _____ Days

10. Age Group: ☐ <2y ☐ 2-4y ☐ 5-19y ☐ 20-39y ☐ 40-59y ☐ 60+ y 11. Sex: ☐ Male ☐ Female

2. CONTACT INFORMATION

12. Telephone Number:

13. Place of Residence: (Department/Province/State / Municipality/City / Neighborhood / Address)

3. CLINICAL HISTORY/RISK FACTORS

14. Did patient receive influenza vaccine during current season: ☐ Yes ☐ No ☐ Unknown

If yes, date of vaccination: / / (Day /mon/year)

If child, < *9 years*: Specify number of doses and dates received: ☐ 1: ___/___/___ (Day /mon/year) ☐2: ___/___/___ (Day/mon/year)

If child, < *6 months*: Did mother receive influenza vaccine? ☐ Yes ☐No ☐Unknown

If yes, date of vaccination: / / (Day /mon/year)

Did mother breastfeed child? ☐Yes ☐No

17.Risk Factors: ☐ Yes ☐ No

Other Factors[1]

☐ Pregnant (☐1T ☐2T ☐3T)

☐ Postpartum

Comorbidities

☐ Asthma
☐ Chronic heart disease
☐ Chronic liver disease
☐ Chronic kidney disease
☐ Hematological disorders
☐ Obesity
☐ Other chronic pulmonary disease
☐ Diabetes
☐ Neurological or neuromuscular disorder
☐ Immunodeficiency (due to illness or treatment)
☐ Other:

4. HOSPITALIZATION

18. Fever onset date: ____/____/____ (Day /mon/year) EW ____ 19. Hospitalization Date: ____/____/____ (Day /mon/year) EW ____

20. Antiviral Use: ☐ Not used ☐ Oseltamivir ☐ Zanamivir ☐ Other Antiviral Start Date: ___/___/___ Day/mon/year

21. ICU Admission: ☐ Yes ☐ No ICU Admission: / / (Day/mon/year) EW ___ ICU Discharge: ____/____/____ (Day/mon/year) EW ___

22. Sample Collection: ☐ Yes ☐ No (Day/mon/year)

1° ☐ Type: ☐ Swab ☐ Aspirate ☐ Bronchial wash ☐ Tissue ☐ Serum ☐ Other ☐ Collection date __/__/__

2° ☐ Type: ☐ Swab ☐ Aspirate ☐ Bronchial wash ☐ Tissue ☐ Serum ☐ Other ☐ Collection date __/__/__

5. LABORATORY DATA

23. Processing:	Receipt Date (Day/mon/year)	Processed	Processing Start Date (Day/mon/year)
1° Sample:	/ /	☐ Yes (☐PCR ☐IFA) ☐ No, reason:	/ /
2° Sample:	/ /	☐ Yes (☐PCR ☐IFA) ☐ No, reason:	/ /

24. Results[2]: ☐ Positive ☐ Negative Delivery Date: (Day/mon/year): __/__/__

☐ A, not subtyped ☐ A(H1N1)pdm09 ☐ A/H1N1 ☐ A/H3N2
☐ Influenza B ☐ B(Victoria) ☐ Influenza B(Yamagata)
☐ RSV ☐ Adenovirus ☐ Parainfluenza I ☐ Parainfluenza II ☐ Parainfluenza III ☐ Other

6. DISCHARGE

25. Discharge Date: __/__/__ (Day/mon/year) EW ___

26. Outcome: ☐ Discharged ☐ Deceased ☐ Transferred

27. Date Case Closed: __/__/__ (Day/mon/year)

Responsible Signature:

[1] You may include other factor based on your specific circumstances, for example: ethnicity, HIV/AIDS, tuberculosis, obesity, alcoholism, smoking

[2] You may include other viruses depending on your laboratory capacity, for example, adenovirus, bocavirus, coronavirus, metapneumovirus, rhinovirus, etc.

Vaccination status ascertainment

SARI surveillance forms/databases

14. Tarjeta de vacuna: Si: ( ) No: ( ) No aplica: ( ) 15.Tipo de vacuna	Aplicada		Nº de dosis aplicada	Fecha de última dosis		
	Si	No		Día	Mes	Año
15.1 Anti Influenza						
15.2 Anti H. Influenzae b						
Anti Neumocócica						
15.3 Heptavalente						
15.4 23 valente						
15.5 Anti meningocócica (*)						
(*)Especifique nombre de la vacuna:						

1. Improve completeness at hospital level and collect additional variables if necessary (ex.doses)

2. Complete vaccination data a posteriori

Matching patients by ID, name, age, address

Electronic national nominal vaccination registry

Chile, Costa-Rica, Uruguay, Colombia and partly in Panama

EPI records at local level (nominal in paper, or Excel, vaccination cards reviewed through household visits/calls

Other countries

Study population

Country	Vaccination Target groups			N SARI hospitals
	Children	Elderly	Individuals with chronic conditions	
Argentina	6–24 months	≥65 years		4
Brazil	6–23 months	≥60 years		29
Chile	6–23 months	≥65 years	X	6*
Colombia	6–23 months	≥60 years		7
Costa Rica	6 months–10 years with chronic cond.	≥65 years		6*
Cuba	6–23 months	≥65 years		TBD
El Salvador	6–59 months	≥60 years		4*
Ecuador	6–59 months	≥50 years	X	3
Honduras	6–35 months with chronic cond.	≥60 years		3*
México	6–59 months; 3–9 years with chronic cond.	≥65 years	X	46
Panamá	6–59 months	≥60 years		10*
Paraguay	6–35 months	≥60 years		2
Peru	6–24 months	≥60 years		3
Uruguay	6–48 months	≥65 years		7*
TOTAL	**6–59 months**	**≥60 years**		**130**

*All SARI surveillance sentinel hospitals included

Influenza cases and controls included in regional VE analysis, REVELAC-i

2013

	Argentina	Brazil	Chile	Colombia	Costa-Rica	Honduras	Panama	Paraguay	El Salvador	Total
Influenza	**36**	**277**	**133**	**69**	**71**	**6**	**20**	**75**	**7**	**694**
(%)	5	40	19	10	10	0.9	3	11	1	100
Controles	54	728	616	165	79	3	49	222	10	1,926
(%)	2.8	37.8	31.98	8.57	4.1	0.16	2.54	11.53	0.52	100
Total	90	1,005	749	234	150	9	69	297	17	**2,620**
(%)	3	**38**	**29**	9	6	0.3	3	**11**	0.7	100

2014

	Argentina	Brazil	Chile	Colombia	Honduras	Paraguay	El Salvador	Total
Influenza	**16**	**145**	**194**	**24**	**8**	**43**	**4**	**434**
(%)	4	33	45	6	2	10	0.9	100
Controles	54	413	1,027	97	20	128	12	1,751
(%)	3	24	59	6	1	7	0.7	100
Total	70	558	1,221	121	28	171	16	**2,185**
(%)	3	**26**	**56**	6	1	**8**	0.7	100

2017: 2851 SARI patients, 587 flu(+) (ARG, CHI, PAR)

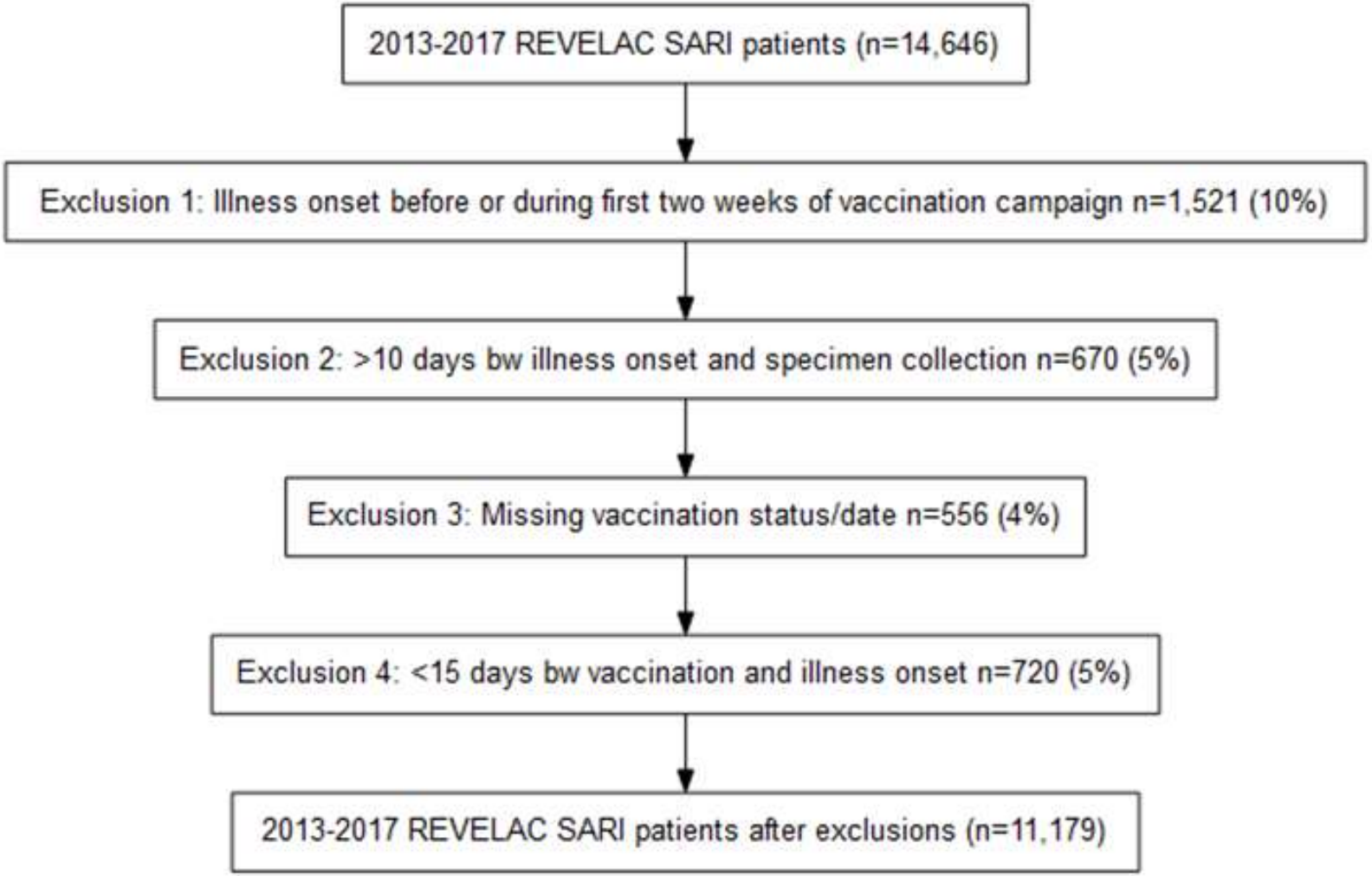
2015

	Chile	Colombia	Paraguay	Peru	Total
Influenza	**394**	**33**	**76**	**17**	**520**
(%)	75.8	6.3	14.6	3.3	100
Controles	1,705	90	222	149	2,166
(%)	79	4	10	7	100
Total	2,099	123	298	166	2,686
(%)	78	5	11	6	100

2016

	Argentina	Chile	Colombia	Paraguay	Uruguay	Total
Influenza	**37**	**226**	**11**	**77**	**67**	**418**
(%)	8.9	54.1	2.6	18.4	16.0	100
Controles	209	1,048	93	224		1,574
(%)	13	67	6	14	0	100
Total	246	1,274	104	301	67	1,992
(%)	12	64	5	15	3	100

REVELAC-I 2013-2017



REVELAC-I 2013-2017

Variable	Cases n=2,409 n(%)	Controls n=8,770 n(%)	p-value
Country			
Argentina	166 (7)	627 (7)	<0.001
Brazil	421 (17)	1148 (13)	
Chile	1300 (54)	5401 (62)	
Colombia	152 (6)	390 (4)	
Paraguay	328 (14)	954 (11)	
Uruguay	42 (2)	250 (3)	
Year			
2013	583 (24)	1855 (21)	<0.001
2014	415 (17)	1687 (19)	
2015	521 (22)	1995 (23)	
2016	397 (16)	1644 (19)	
2017	493 (20)	1589 (18)	
Gender			
Male	1116 (46)	4375 (50)	0.002
Female	1293 (54)	4395 (50)	
Age group			
0-18 years	679 (28)	3338 (38)	<0.001
19-64	399 (17)	1224 (14)	
65+	1331 (56)	4208 (48)	

REVELAC-I 2013-2017

Variable	Cases n=2,409 n(%)	Controls n=8,770 n(%)	p-value
≥one chronic condition	1573 (65)	5518 (63)	<0.001
Asthma	197 (8)	732 (8)	0.25
Diabetes	416 (17)	1176 (13)	<0.001
Respiratory disease	407 (16)	1595 (18)	0.31
Cardiovascular disease	323 (13)	1037 (12)	0.006
Liver disease	37 (2)	126 (1)	0.91
Renal disease	164 (7)	536 (6)	0.37
Obesity	113 (5)	323 (4)	0.05
Immune disease	94 (4)	479 (5)	0.001
Seasonal vaccination	897 (37)	4220 (48)	<0.001
Admitted to ICU	424 (18)	1433 (16)	0.02
Deceased	220 (9)	625 (7)	0.004
Days from illness onset to specimen collection			
0 to 2	576 (24)	2633 (30)	<0.001
3 to 5	57 (2)	393 (4)	
6 to 10	1776 (74)	5744 (65)	

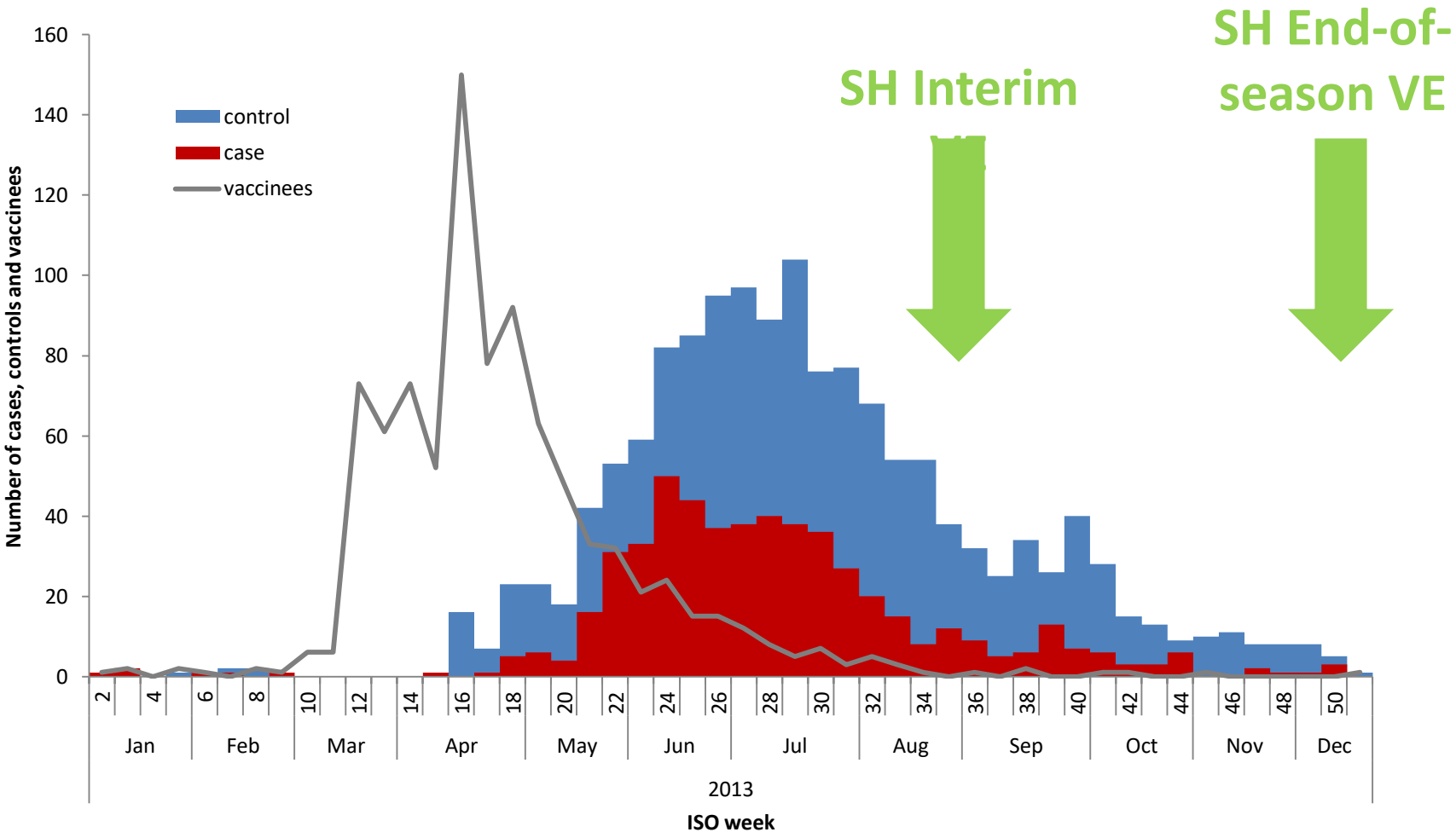
REVELAC Flu VE estimates 2013-2017

Table 2. Multiple Logistic Regression for VE

	Cases % vaccinated (n/N) %	Controls % vaccinated (n/N) %	aVE
Overall	897/2409 (37)	4220/8770 (48)	37 (30, 42)
2013	255/583 (44)	1070/1855 (58)	43 (21, 53)
2014	176/415 (42)	876/1687 (52)	37 (20, 51)
2015	169/521 (32)	876/1995 (44)	41 (27, 52)
2016	120/397 (30)	729/1644 (44)	50 (37, 61)
2017	177/493 (36)	669/1589 (42)	16 (-0.07, 34)
H3N2	431/1101 (39)	-	38 (30, 46)
H1N1p	276/769 (36)	-	45 (36, 53)
B	162/379 (43)	-	38 (25, 50)
Children	281/679 (41)	1709/3338 (51)	33 (20, 44)
Adults 19 to 64	100/399 (25)	423/1224 (35)	41 (22, 55)
Adults 65+	516/1331 (39)	2088/4208 (50)	37 (29, 45)

Adjusted for vaccination status, month of illness onset, pre-existing conditions, and age category/years.

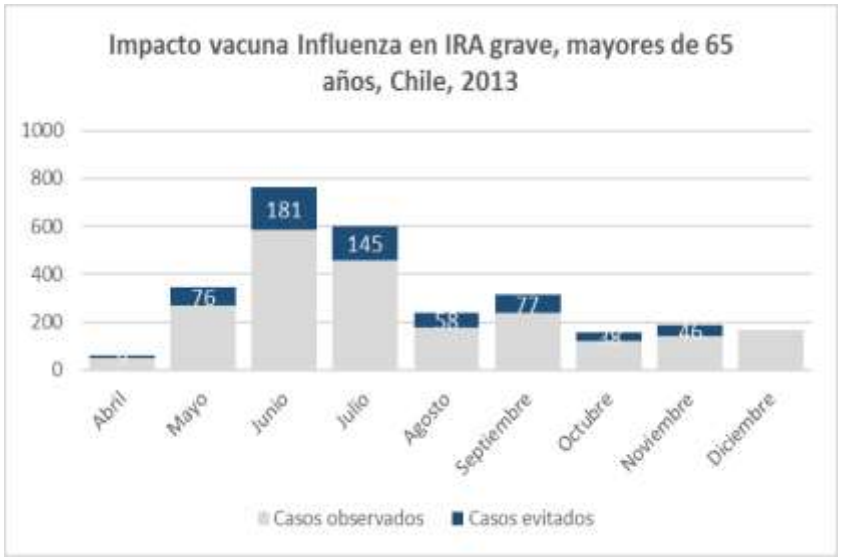
Distribution of cases, controls per week of symptoms onset and vaccinees per week of vaccination, in 9 LAC countries, 2013



Influenza Vaccine Impact

Number of averted SARI hospitalizations by vaccination among children <5 years and the elderly, Chile 2013-14

2013

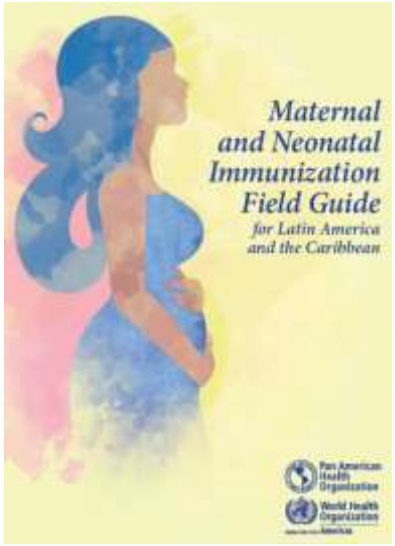


2014

Challenges for REVELAC-i

- Sustainability of the platform
  - High turnover of surveillance and EPI staff,
  - Uses existing surveillance platform (no additional resources for staff or research groups)
  - Information systems/integration
  - Political changes
- Vaccination status retrieval and timeliness of interim VE estimates
- Sample size
- Translation of evidence for decision makers

31/35 countries that vaccinate pregnant women against influenza are located in the Americas



Technical guidelines for Maternal and neonatal immunization:

- ✓ Vaccination recommendations
- ✓ Available vaccines
- ✓ Current evidence
- ✓ Operational aspects
- ✓ Communication
- ✓ Best practices


Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Factors associated with a successful expansion of influenza vaccination among pregnant women in Nicaragua

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In 2013, Nicaragua expanded recommendations to include influenza vaccination to all pregnant women in Managua:

- Survey among 1,807 pregnant women who delivered at public hospitals in Managua to evaluate the uptake of influenza vaccination and factors associated with vaccination.
- Four antenatal visits were associated with receipt of influenza vaccination (OR=2.6 [1.15; 5.81]).
- Receipt of influenza vaccination recommendation from a health care provider was positively associated with receipt of influenza vaccination (OR=14 [10; 19]).

1st network meeting
La Antigua Guatemala, 2013

2nd network meeting,
Cartagena de Indias, 2014

3rd network meeting,
Santiago de Chile, March 2016

GRACIAS!

http://www.paho.org/revelac-i/