

Monitoring For Rotavirus Serotypes In The Americas

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** The findings and conclusions in this presentation are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention (CDC).*



PAHO/WHO Collaborating
Center for Rotavirus and Other
Viral Agents of Gastroenteritis

Introduction

- Rationale for rotavirus strain surveillance
- Introduction to serotypes
- Surveillance in the Americas
- Conclusions and future directions

Rotavirus Strain Surveillance in Vaccine Era

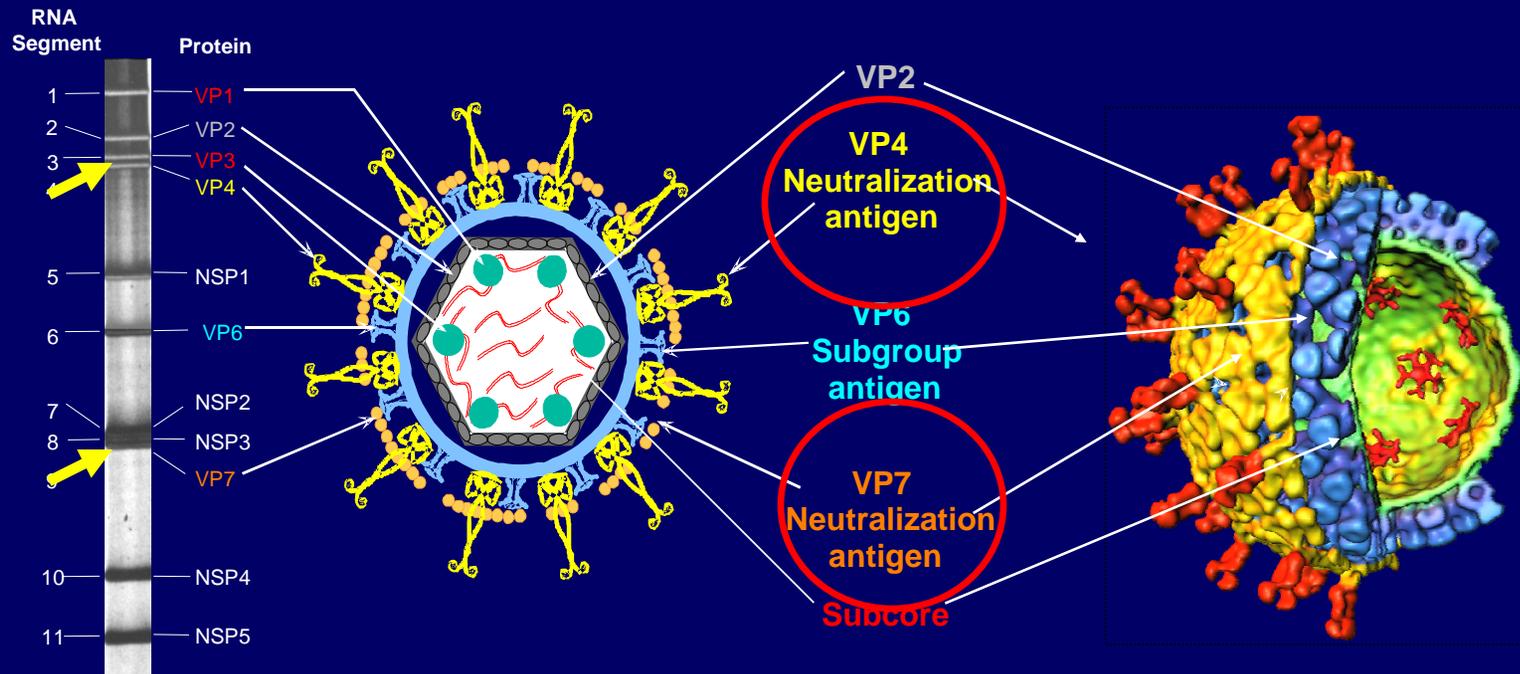
Vaccine Research

- Impact of vaccines on strain prevalence and evolution
 - Will immune selection over time result in emergence of strains that escape protection?
- Vaccine stability
 - Reversion to virulence
 - Transmission, gastroenteritis in unvaccinated
 - Reassortment with wild-type rotavirus

Virus Evolution

- origin of new strains through reassortment
 - Role of animal rotaviruses
- genetic variation in RV genes

Rotavirus Serotype Classification



Provided by MK Estes

P type
G type

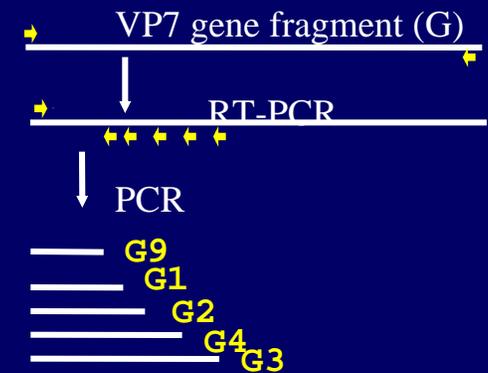
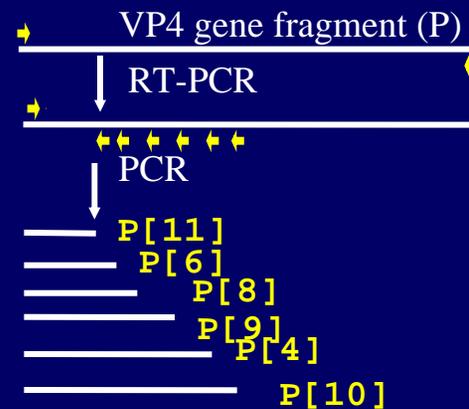


Methods: Processing Stool Samples for Strain Surveillance

Rotavirus Detection
(e.g., IDEIA (Oxoid [Ely]))

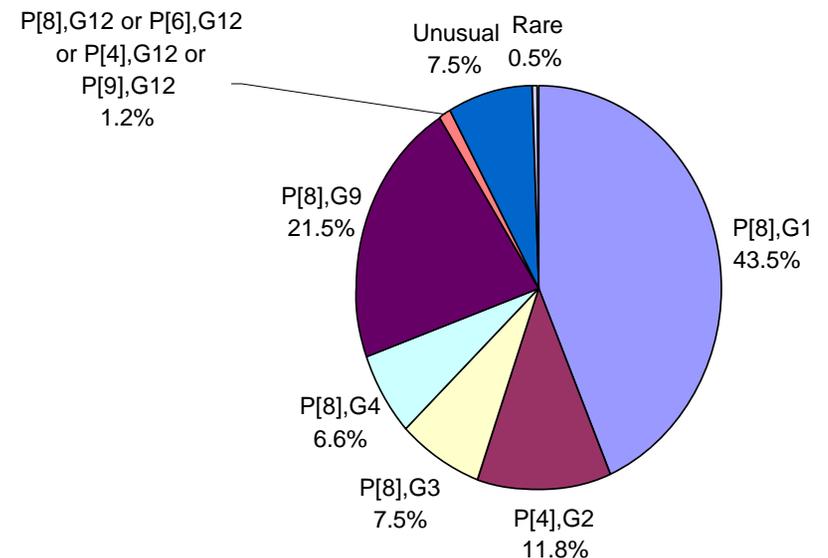
Genotype positives
using hemi-nested
RT-PCR

Identify genotypes
by electrophoresis



Human Rotavirus Serotypes and Genotypes

- Four historically common strains globally (>30 yrs)
- P[8]G9 emerged since 1995
- Emerged since 2000



Data of K Banyai, PG types 2004-2008

Uncommon rotavirus genotypes: >20 G types, >30 P types and ~80 G-P combinations in humans

Uncommon G & P types

G5-P[6], [8]

G6-P[6], [9] & [14]

G8-P[1], [14]

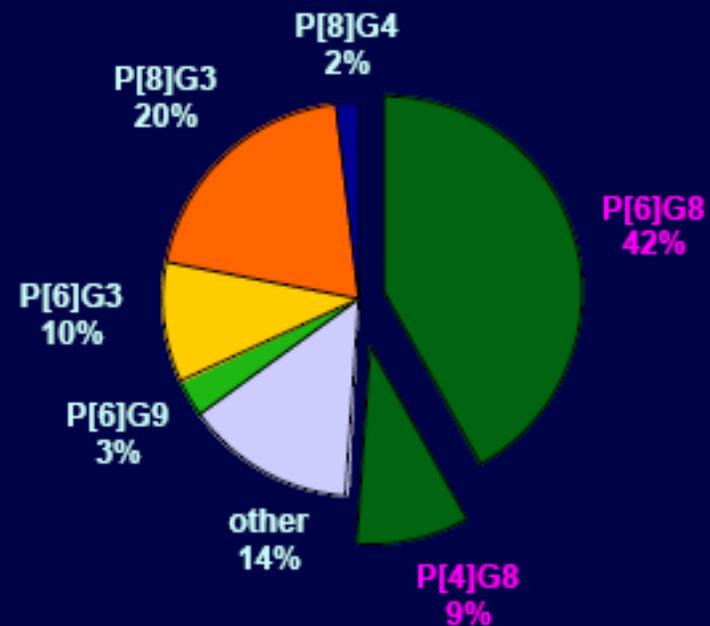
G10-P[9], [11] & [14]

G12-P[6], [8]

G3-P[11], [14]

Occasionally some are regionally important

Malawi serotype G8 (51%)



Adapted from Kirkwood et al

Rotavirus Serotypes: Lessons learned from surveillance

- Only few globally common strains
- Periodic emerging strains
- Huge diversity
- Large temporal and geographic variation

Surveillance in the United States

- National Rotavirus Strain Surveillance System (NRSSS)
- New Vaccine Surveillance Network (NVSN)

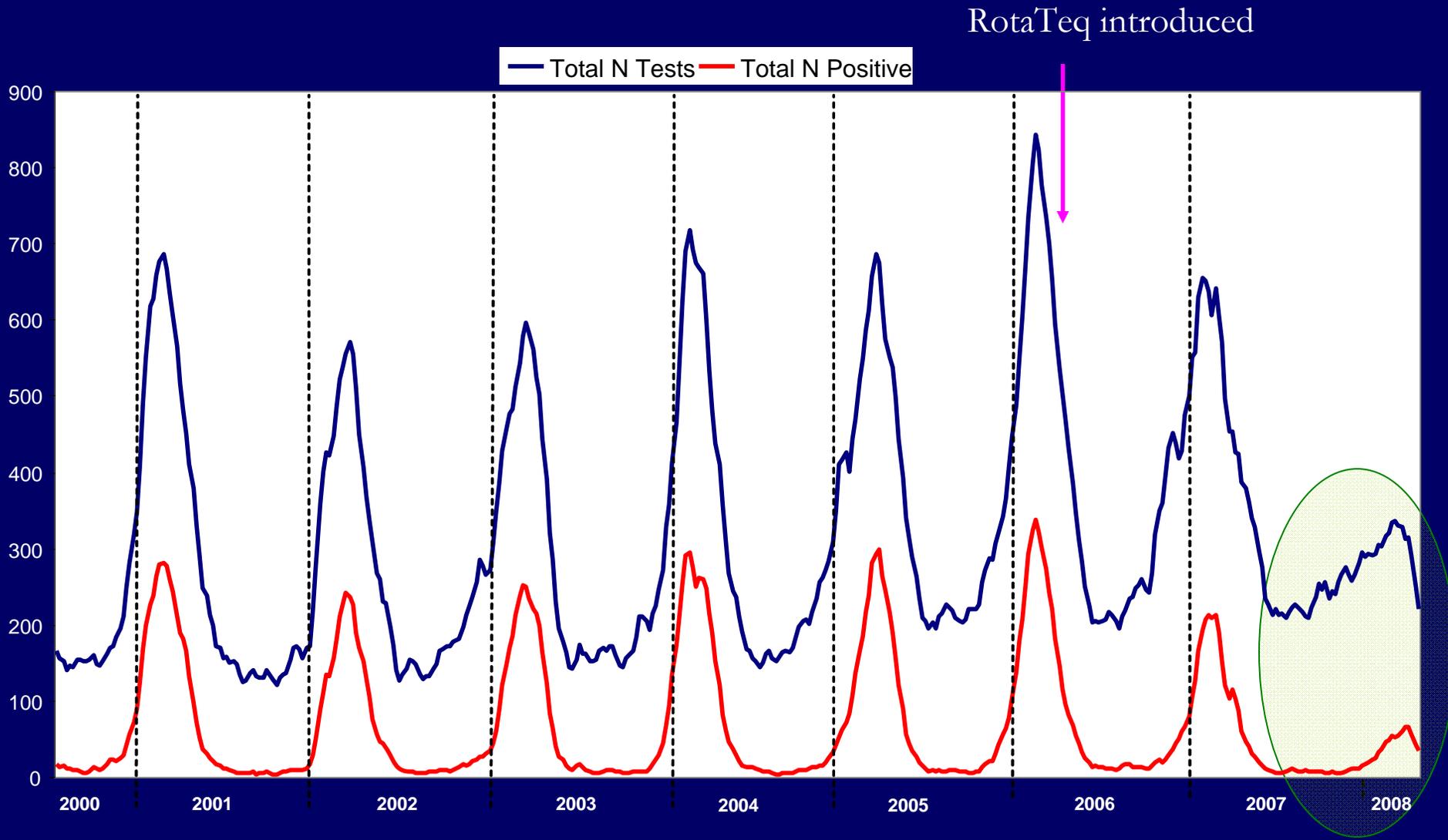


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National Rotavirus Strain Surveillance System (United States, 1996-2008)

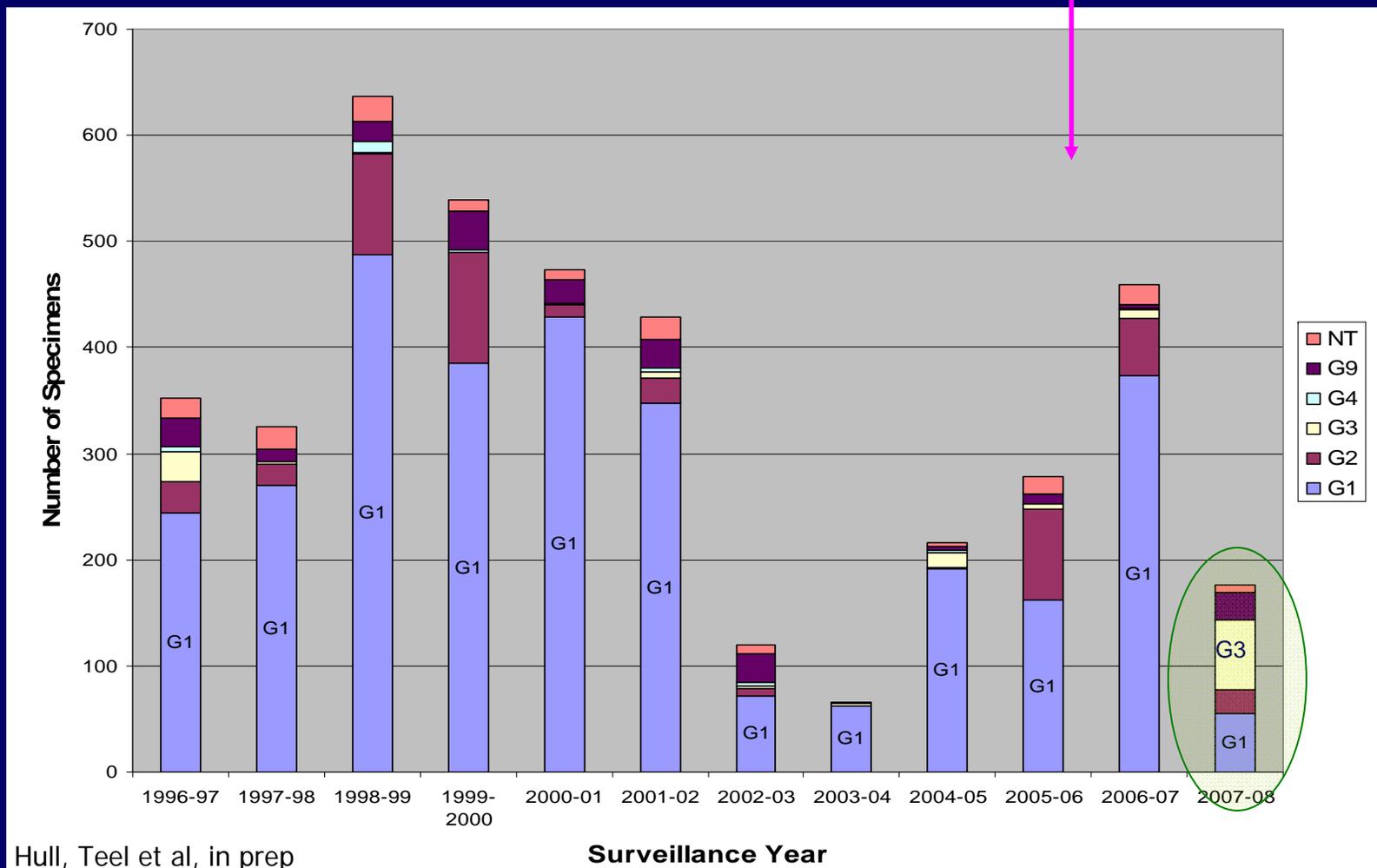


Number of Positive and Total Rotavirus Tests, United States, 2000-2008, 33 Continuously Reporting Labs



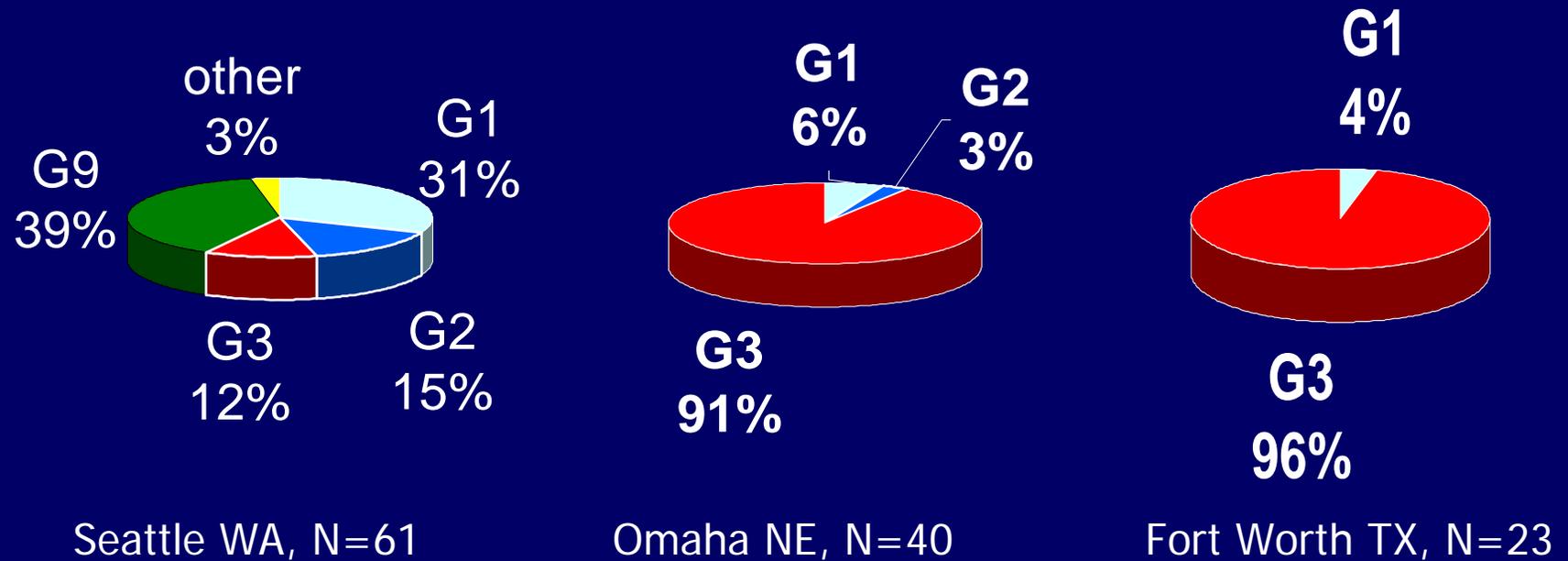
Longitudinal Variation of Rotavirus G Types in the United States (1996-2008)

RotaTeq introduced



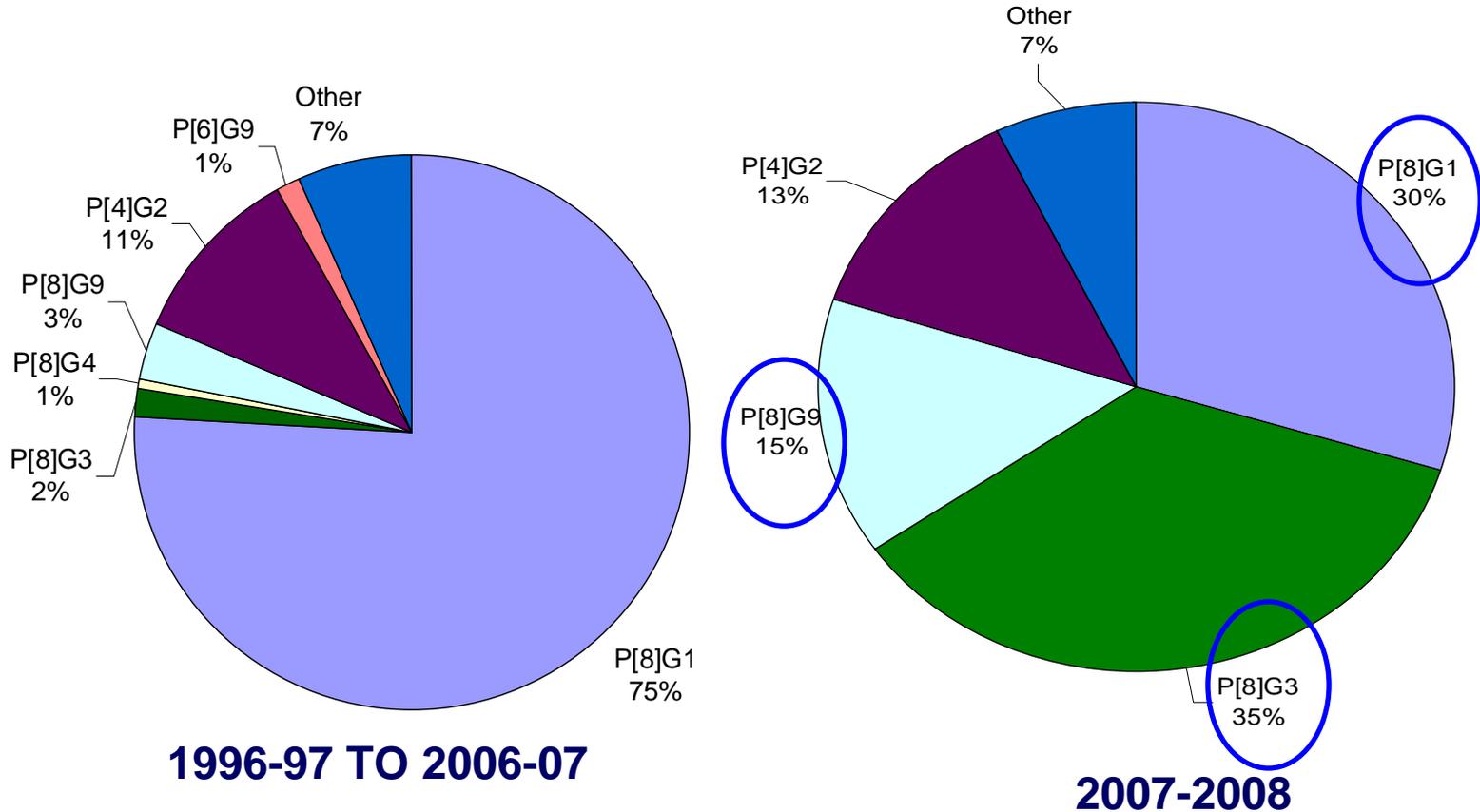
Hull, Teel et al, in prep

Geographical Serotype Variation USA (2007-2008)

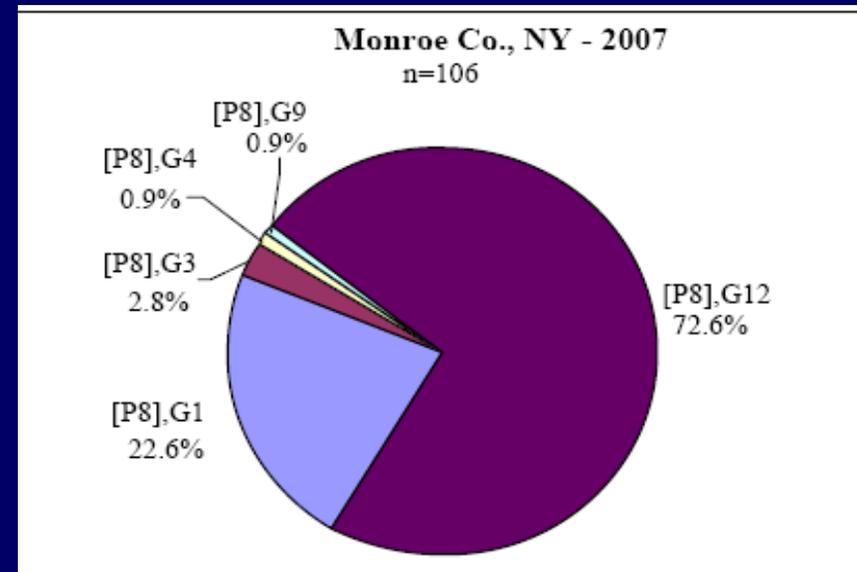
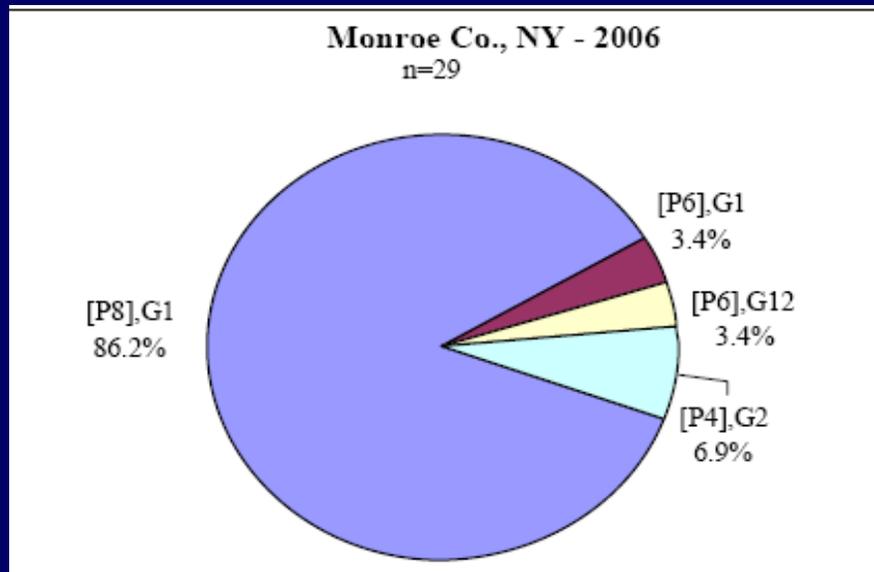


Hull, Teel et al, in prep

P and G Genotypes of Rotavirus Strains in United States (NRSSS)



Genotyping by sequencing identified a major outbreak of genotype G12 in the United States (primers for G12 are not routinely present in multiplex RT-PCR)

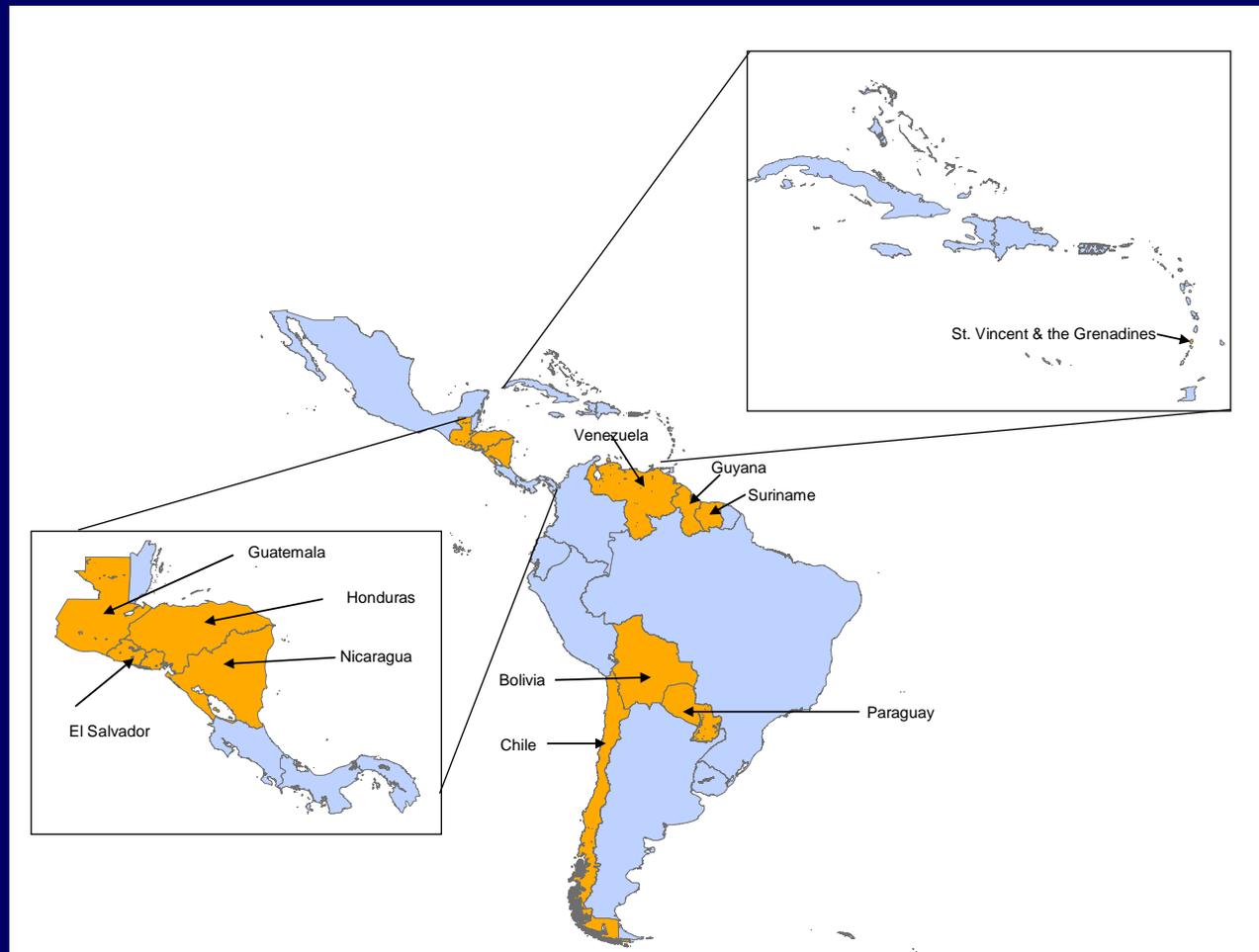


From Payne et al, PIDJ, 2009

Surveillance in Latin America and the Caribbean

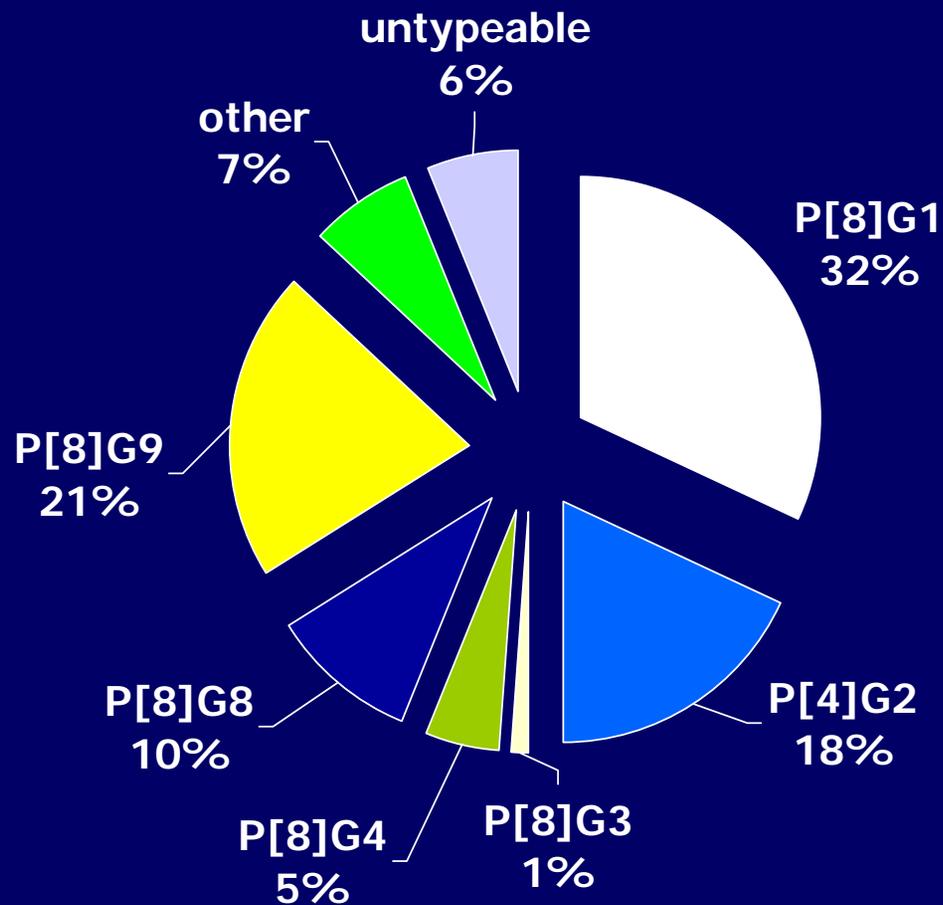
- Set up starting 2004 to assess disease burden and strains
- Strains received from rotavirus sentinel hospital surveillance network 2005-2007 analyzed at CDC
- Genotyping results from seven sites

Map of Countries Participating in the Rotavirus Surveillance Network in Latin America and the Caribbean



L Oliveira et al, JID 2009

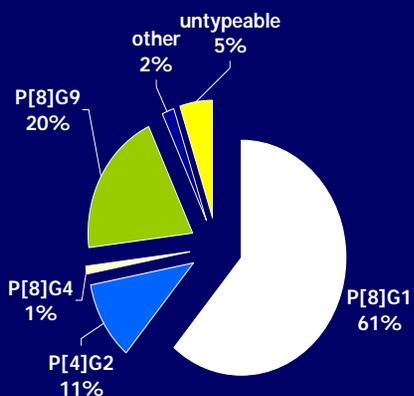
Strains Circulating in Seven Latin American Countries (2005-2007)



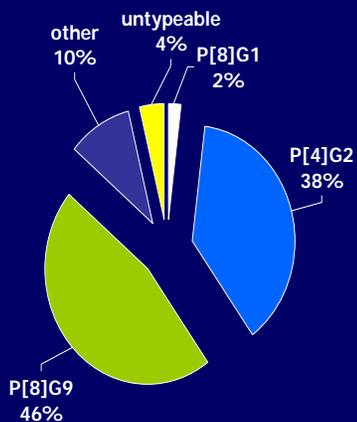
N=388
Adapted from
L Oliveira et al, JID 2009

Regional Variation of Strains Circulating in the Latin American (2005-2007)

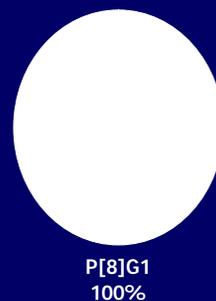
El Salvador



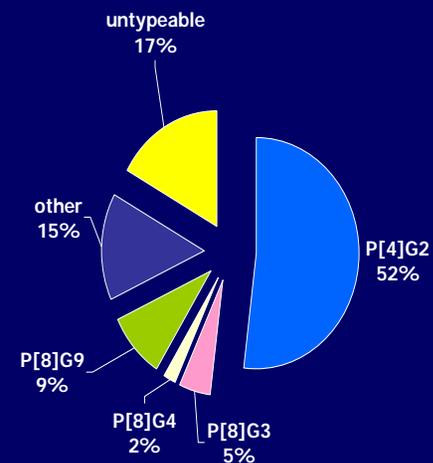
Guatemala



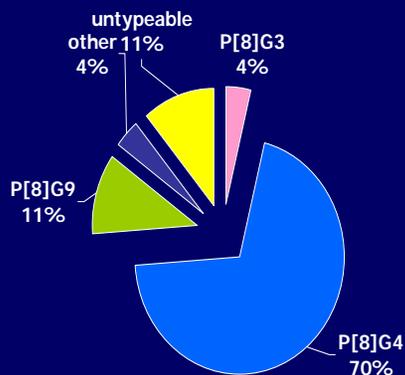
Guyana



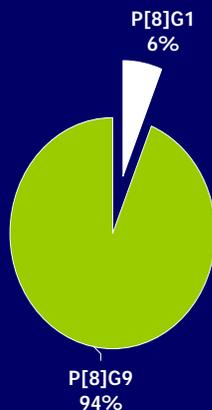
Honduras



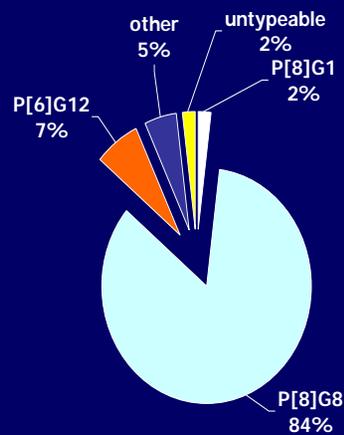
Nicaragua



St Vincent



Suriname

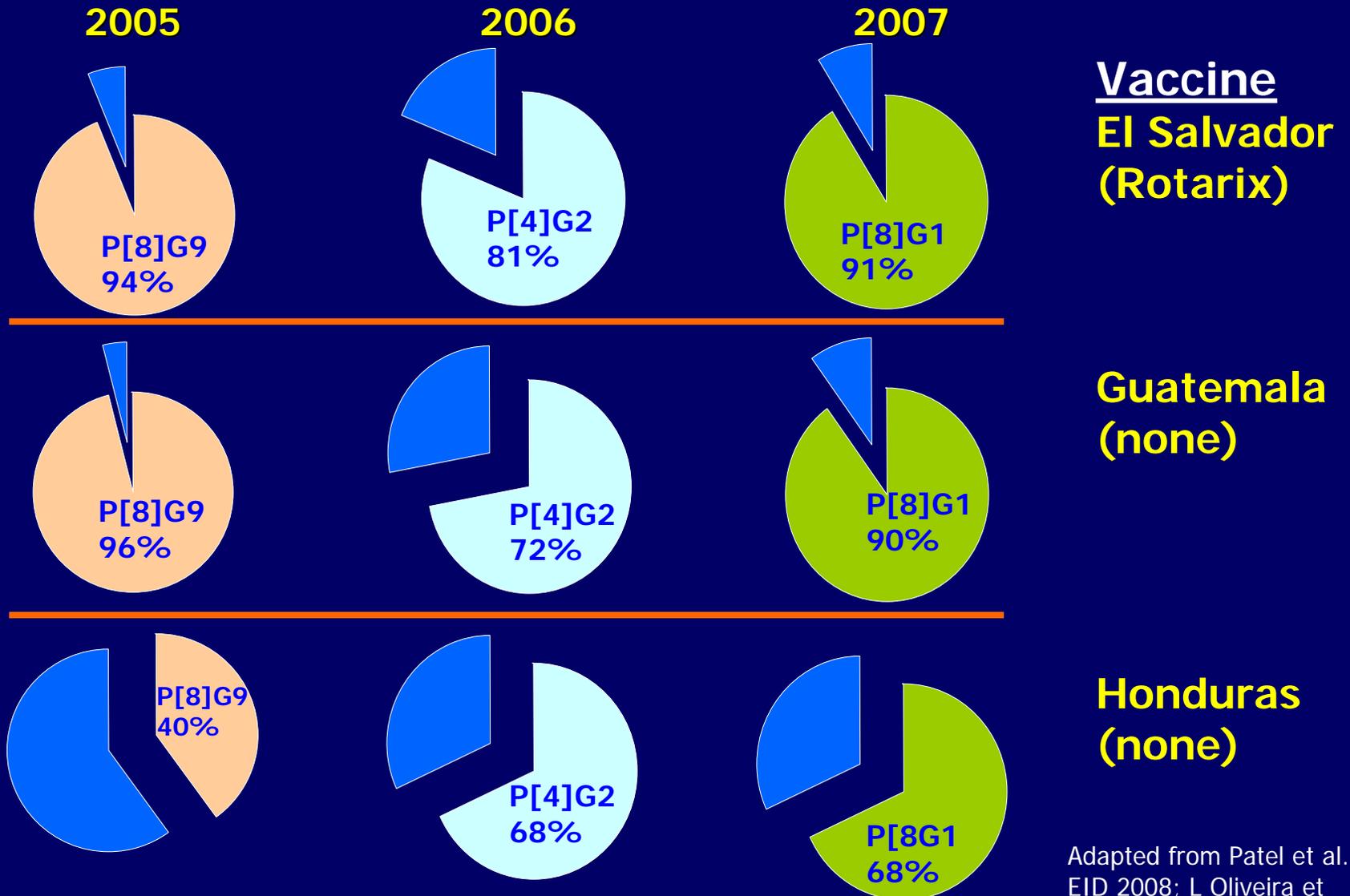


Adapted from
L Oliveira et al, JID 2009

Are Vaccination Programs Impacting Prevalence of Common Strains?

- Vaccination of populations with Rotarix
 - Increased prevalence of P[4]G2 (Brazil, Australia)
- Vaccination with RotaTeq
 - Increased prevalence of P[8]G3 (Australia, United States)

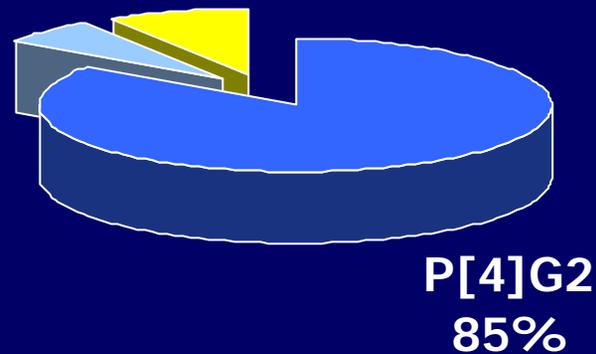
Temporal Variation in Predominant Strain, Central America



Adapted from Patel et al.,
EID 2008; L Oliveira et
al JID 2009

RotaTeq Vaccinated Population and increased P[8]G3

Rotavirus Genotypes in Nicaragua, 2007-2008



N=262, Patel et al, JAMA 2009

Conclusions and Future Directions

- No convincing evidence for immune selection, more likely natural variation
 - Increasing prevalence P[4]G2, P[8]G3 in countries that have not adopted vaccines
- Supported by continued moderately high field efficacy of Rotarix vs P[4]G2 (e.g., Brazil, Australia [Snelling 2009, Nakagomi 2009] , RotaTeq vs P[8]G3 [e.g., Boom et al 2008])
- Long term effectiveness studies where serotype specific VE and overall disease trends can be assessed
 - Needed to discriminate observed trends from natural strain fluctuations, emergence of new strains etc

CDC

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Cuauhtemoc Ruiz Matus

Epidemiological Surveillance of Ministries of
Health from countries

Members of the NVSN and NRSSS networks in
the United States