

# Target setting in water-borne disease interventions

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# Two types of targets



- **General:** strengthening of the water-related disease surveillance system to develop a solid **evidence base** for target setting. This includes inclusion in appropriate general (CISID) and specific (ENHIS) monitoring databases
- **Specific:** conducting **direct health interventions** in combination with improved water and sanitation and hygiene measures

# Why targeting direct health interventions



- Direct impact on the burden of water-related disease
- Scientific protocols exist
- Existing infrastructure in WHO to take immediate action
- Reasonable intervention cost
- Existing support mechanism
- Significant cost-benefit

# Types



- Vaccine-preventable diseases (VPD)
  - Rotavirus
  - Hepatitis A
  - Typhus
  - Cholera
  
- Neglected Diseases (NTD)
  - Helminth infections

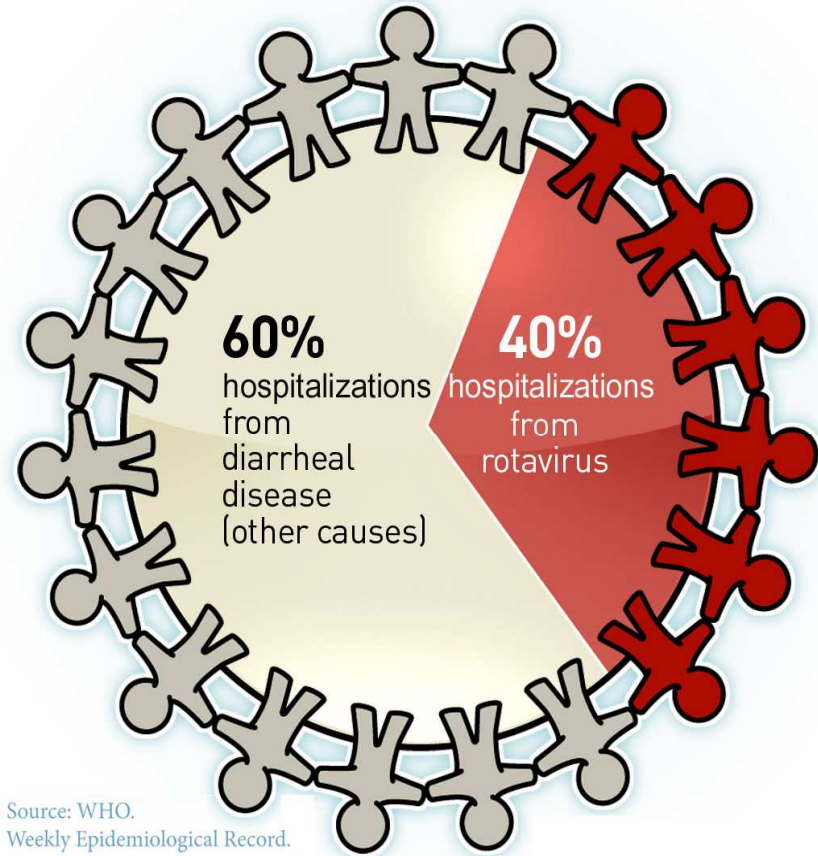
# Rotavirus is the Most Common Cause of Severe, Dehydrating Diarrhea among Children Worldwide



## Each year it causes:

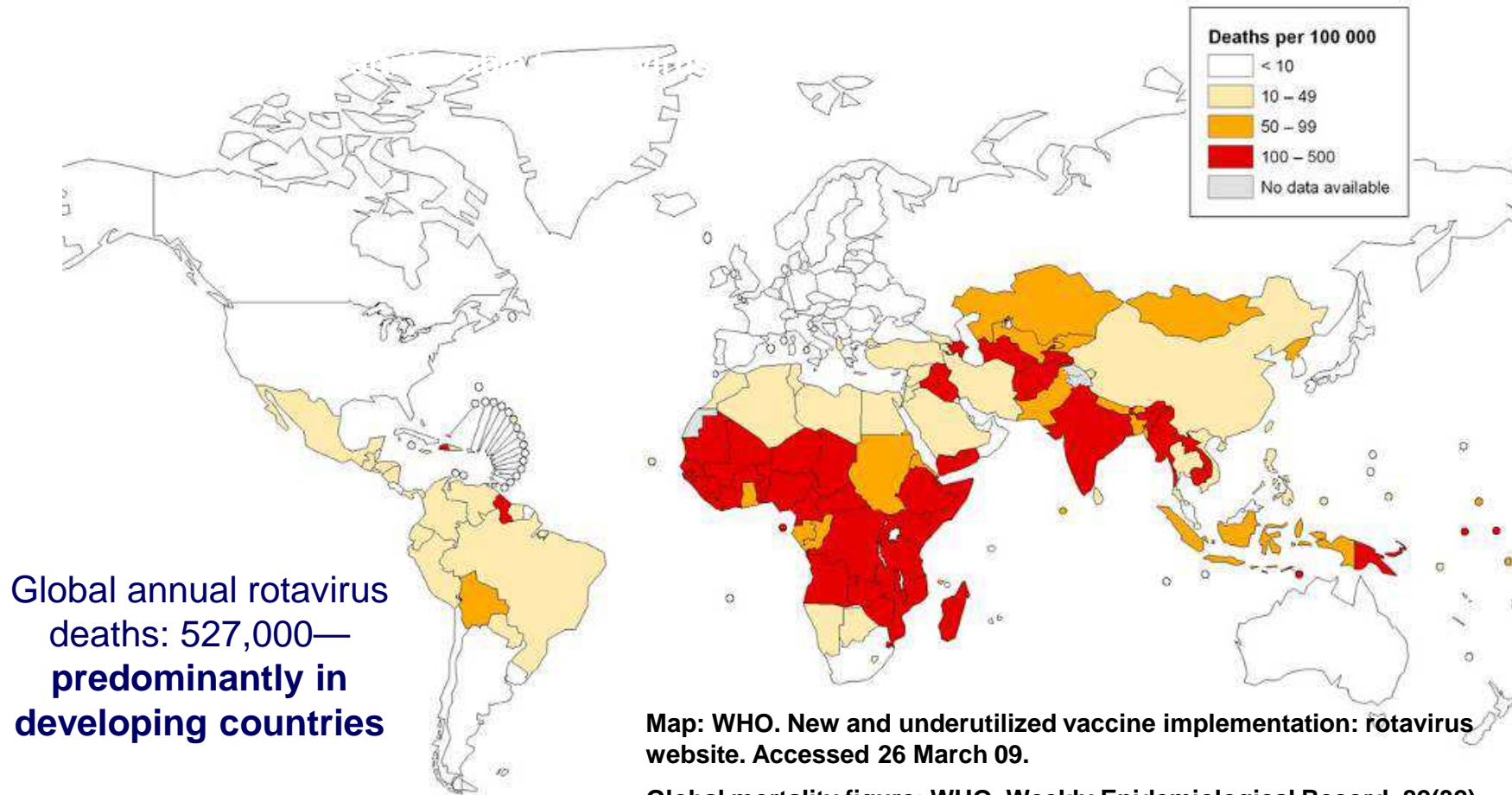
- Over 500,000 deaths
- 111 million cases of diarrhea
- 25 million outpatient visits
- 2 million hospitalizations

**Global surveillance shows that 40% of diarrheal hospitalizations in young children are due to rotavirus.**



Source: WHO.  
Weekly Epidemiological Record.  
2008;83(47).

# From 1999 – 2009: Over 5 Million Children Died from Rotavirus Disease

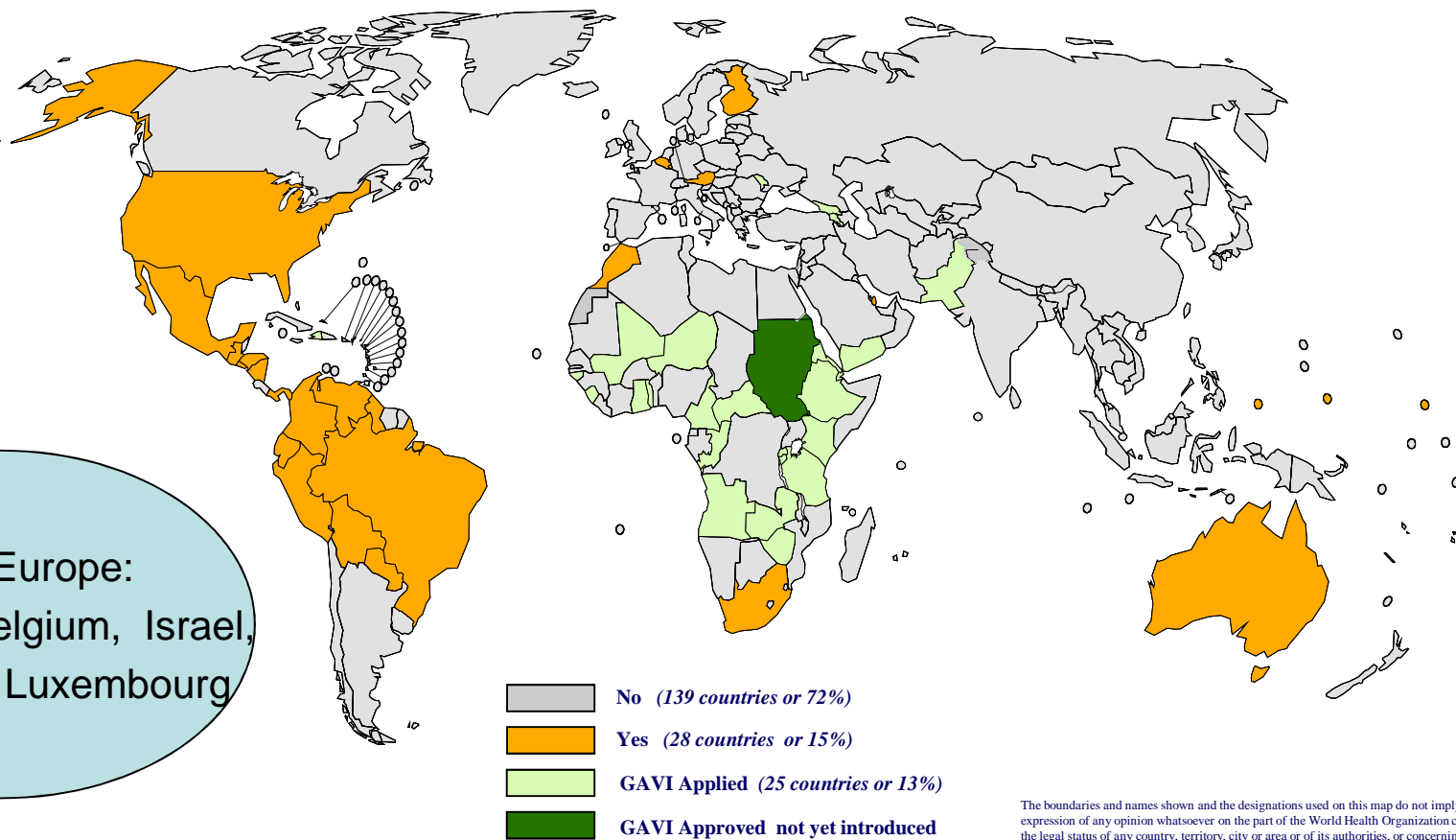


# Countries Using Rotavirus Vaccine in National Immunization Schedule, 2011



11% of the total 2011 birth cohort are living in a country where the vaccine is offered nationwide

In Europe:  
Austria, Belgium, Israel,  
Finland, Luxembourg



Source: WHO/IVB database, 193 WHO Member States. Data as of June 2011

Date of slide: 17 June 2011

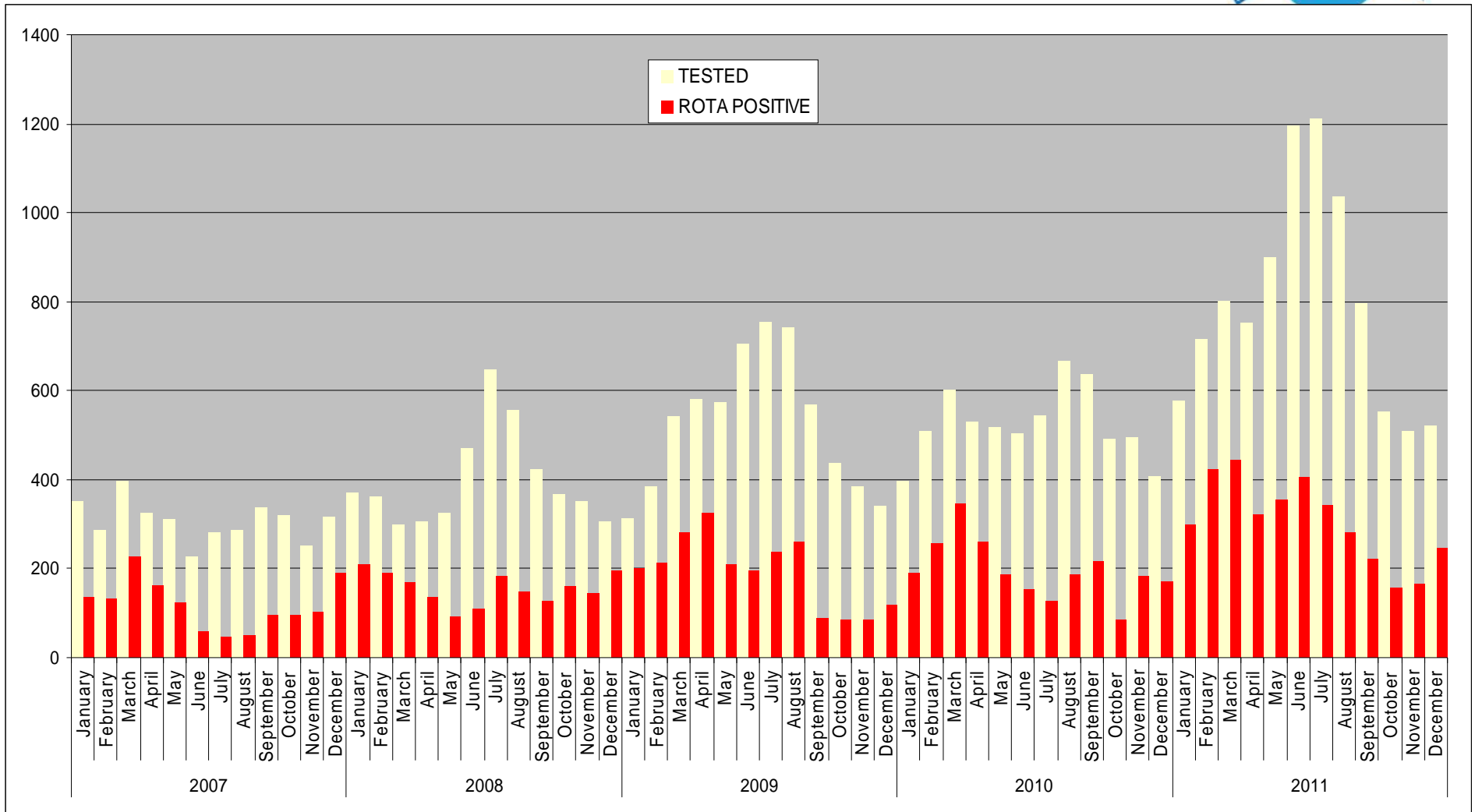
The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers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

(Bratislava, Slovakia 10-11 May 2012)

# WHO/EURO Rotavirus Surveillance

## Seasonal trends of diarrhea and rotavirus diarrhea



(Bratislava, Slovakia 10-11 May 2012)



# Direct health interventions - VPI



- Rotavirus infections

- Impact



- over 70,000 hospitalizations in EU
    - one of the main causes of diarrhoeal disease in young children
    - Median cost € 1417 per case (EU)
  - SAGE recommends inclusion of rotavirus vaccination of infants to all national immunization programmes

# Ample room for improvement



	<b>Number of countries in regions</b>	<b>Number of countries using Rota vaccines (% of total) - 2011</b>	<b>Number of GAVI-eligible countries in region</b>	<b>GAVI-eligible countries using Rota vaccines (% of total) – 2011</b>
EUR	53	<b>5 (10%)</b>	8	0* (0%)
<b>Global</b>	<b>193</b>	<b>28 (14%)</b>	<b>72</b>	<b>3* (4%)</b>

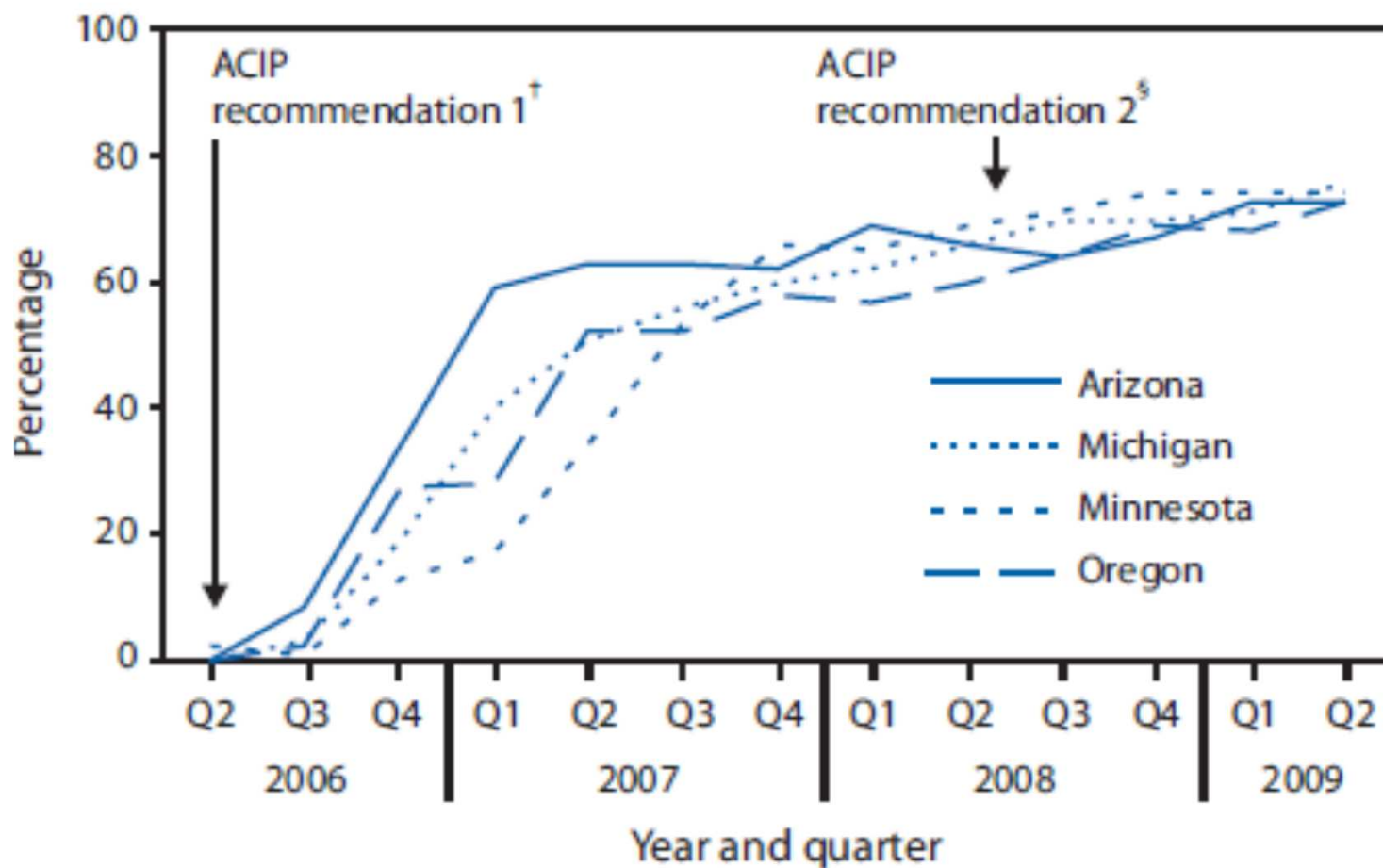


# Evaluating Rotavirus Introduction

- Coverage
- Disease Reduction (impact)
- Cost

Two Countries: USA, Armenia

# First 3 years after introduction: Percent of infants aged 5 months with $\geq 1$ RV dose, 4 US States



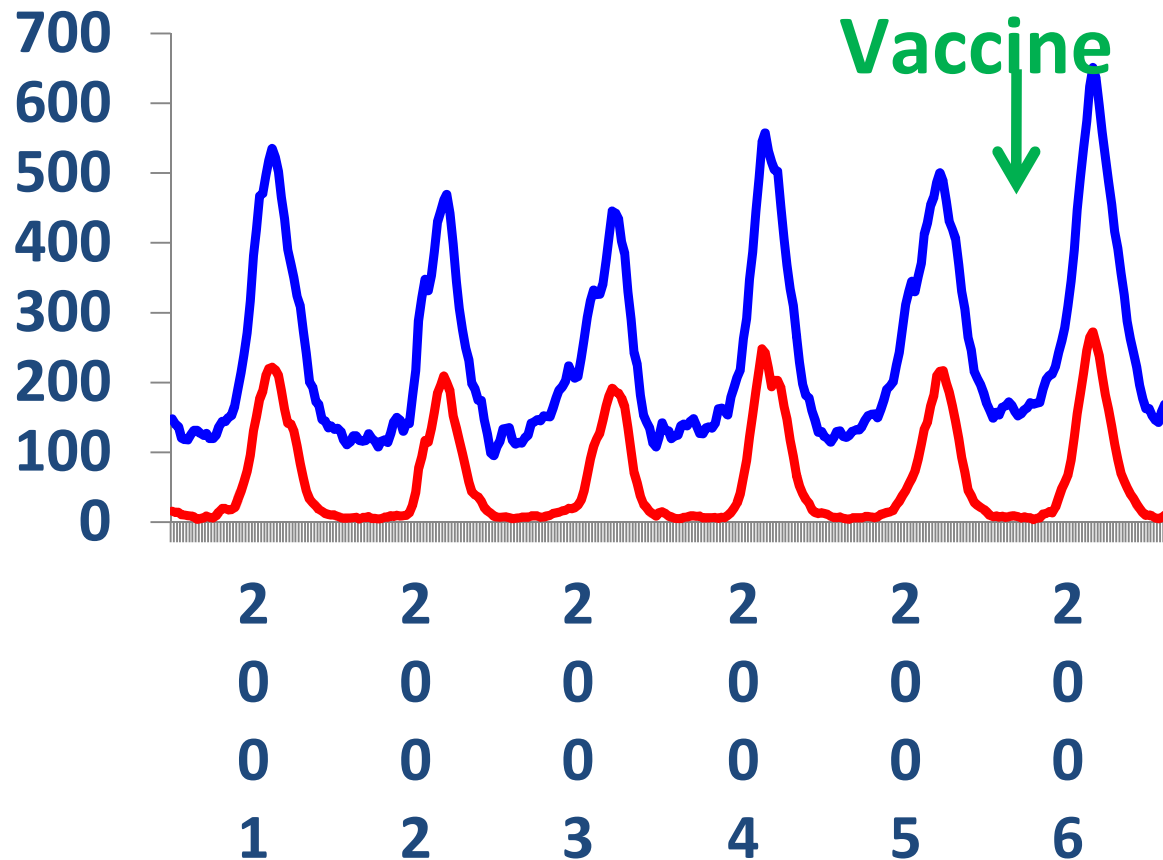
# National Rotavirus Laboratory Surveillance



- Network of 67 laboratories reporting since 2000
- Weekly reporting:
  - # specimens tested for rotavirus
  - # positive tests

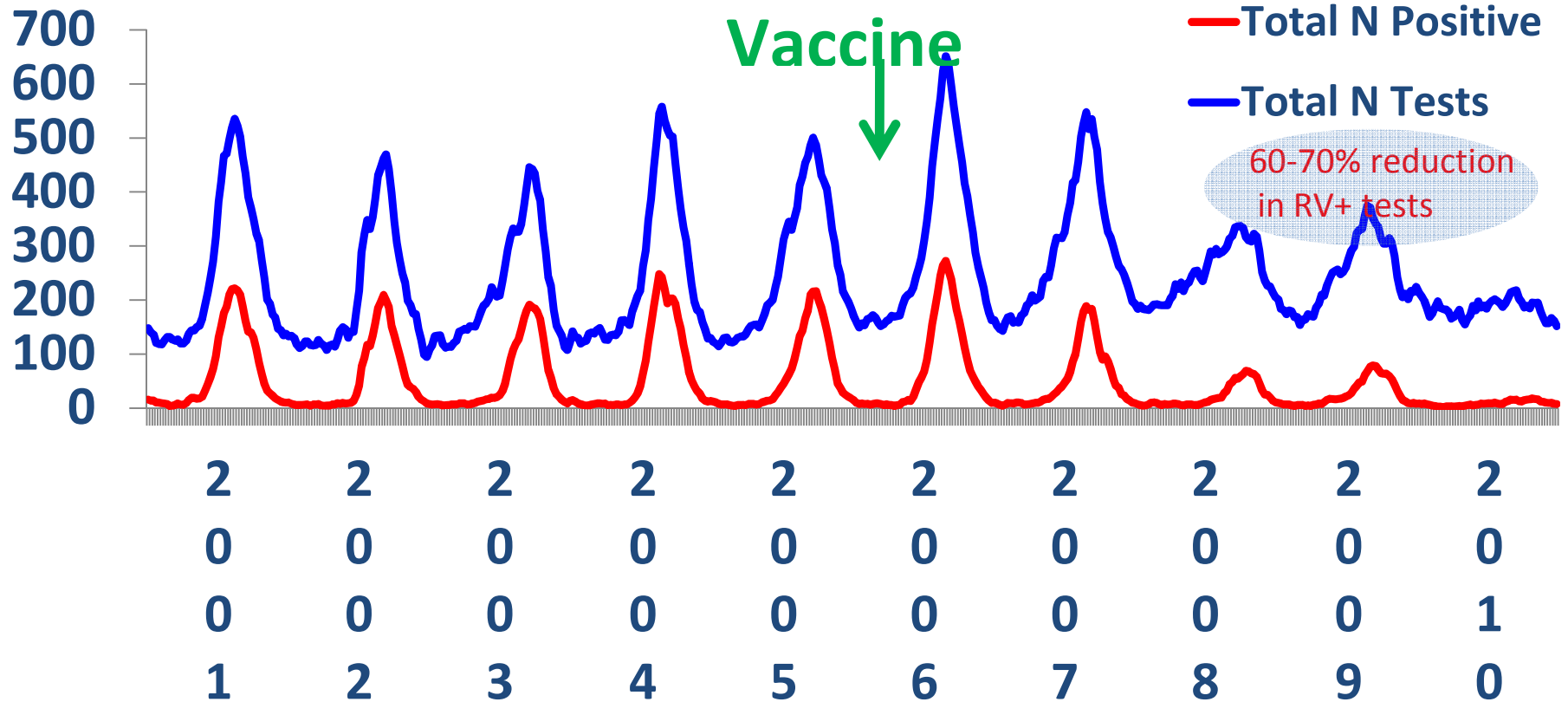


# Total & Positive Rotavirus Tests, 2000-2010





# Total & Positive Rotavirus Tests, 2000-2010



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Tate et al. PIDJ 2011

# Age-Specific Rotavirus Hospitalization Rate Reduction and Vaccine Coverage, NVSN USA



**Age**

**Decline in rotavirus hospitalization rate (2008 vs. 2006)**

**Rotavirus vaccine coverage in 2008 (>=1 dose)**

**< 1 year**

**66%**

**56%**

**1 -< 2 years**

**95%**

**44%**

**2 -< 3 years**

**85%**

**<1%**

*This age cohort was ineligible to receive rotavirus vaccine (herd immunity?)*



# Vaccine Efficacy Estimates Generally Correlate with Mortality Quartiles



WHO mortality strata	Under-5 Child Mortality	Vaccine Efficacy	Countries
<b>HIGH</b>	<b>Highest (top 25%)</b>	<b>50-64%</b>	<b>Ghana, Kenya, Malawi, Mali</b>
<b>INTER-MEDIATE</b>	<b>High mid (next 25%)</b>	<b>46-72%</b>	<b>Bangladesh, South Africa</b>
	<b>Low mid (next 25%)</b>	<b>72 - 85%</b>	<b>Viet Nam, Region of the Americas</b>
<b>LOW</b>	<b>Least (lowest 25%)</b>	<b>85 – 100%</b>	<b>Region of the Americas, Europe, Western Pacific</b>

[http://www.who.int/wer/2009/wer8451\\_52.pdf](http://www.who.int/wer/2009/wer8451_52.pdf)

<http://www.who.int/whosis/en/>

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# Cost Effectiveness Studies - Armenia



- Cost and health implications of
  - Mortality
  - Hospitalisation;
  - Primary healthcare consultation;
  - Episodes not leading to medical care

# Cost Effectiveness Studies - Armenia



- Disease reduction:
  - Prevent 35,000 cases;
  - 4000 primary care consultations;
  - 1,200 hospitalisations;
  - 2 deaths per birth cohort vaccinated.

# Cost Effectiveness Studies - Armenia



- Cost of Vaccine:
  - \$300,000 – 2012
  - \$800,000 – 2016 (end of GAVI support)
  - \$250,000 – 2025 (market maturity)

# Cost Effectiveness Studies - Armenia



- Reduced costs:
  - \$45,000 2012
  - \$250,000 by 2017.
  - By 2025, the vaccination programme may be close to cost saving

# Cost Effectiveness Studies - Armenia



- Cost Effectiveness:
  - GDP per capita: \$3800;
  - (Cost per DALY averted) of vaccination
    - \$500 (Ministry of Health)
    - \$760 (including costs accrued to both the Ministry and to GAVI),
    - \$390 societal perspective including indirect costs

# Cost Effectiveness Studies Conclusions



- Very cost-effective” from a WHO standpoint
  - Even if less favourable assumptions are used in the model regarding vaccine price and the incidence of disease
- A decision about vaccination should ideally be made by comparing rotavirus vaccination to alternative healthcare interventions

# Global CES



- Under 70% coverage, vaccinating one single birth cohort would prevent about
  - 55% of rotavirus associated deaths in the 72 GAVI-eligible countries.
  - Assuming \$25 per vaccinated child (~\$5 per dose), using a cost effectiveness threshold based on per capita GDP, the vaccines were considered cost-effective in 68 of the 72 countries
- Over 10-year period, routine rotavirus vaccination would
  - prevent 0.9-2.8 million rotavirus associated deaths among children under age 5 in the poorest parts of the world,
  - prevent 4.5-13.3 million hospitalizations
  - 41-107 million cases of outpatient clinic visits

**Kim et al. BMC Public Health 2010, 10:253**



# WHO Recommendations for Use of Rotavirus Vaccines December 2009



- Rotavirus vaccine for infants should be included in **all** national immunization programmes.
- Vaccine introduction is *strongly recommended* in countries where **diarrhoeal deaths account for  $\geq 10\%$  of mortality** among children aged <5 years.
- The first dose of vaccine should be administered at age 6–15 weeks. Maximum age for administering the last dose of vaccine should be 32 weeks.

# THANK YOU



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