

# Rotavirus vaccination in the NT: *a revolution for children in Central Australia?*

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# Background



- In late 2006, rotavirus vaccination was made available for all NT children born on or after August 1<sup>st</sup> 2006.
- The NT immunisation program uses RIX4414 (Rotarix, Glaxo Smith Kline) an attenuated G1P[8] strain
- 2 doses are administered: at 2m (before 14wk) and 4m (before 24wk)
- In late Autumn and Winter 2007, a widespread G9P[8] rotavirus outbreak occurred across Central Australia.

- Retrospective review of admissions to Alice Springs Hospital
- ICD10 code pertaining to infectious gastroenteritis on hospital separations database
- During two epidemic periods
  - G9P[8]: March 12<sup>th</sup> to July 11<sup>th</sup> 2007
  - G2P[4]: December 29<sup>th</sup> 2003 to March 11<sup>th</sup> 2004
- Approval granted by CAHREC

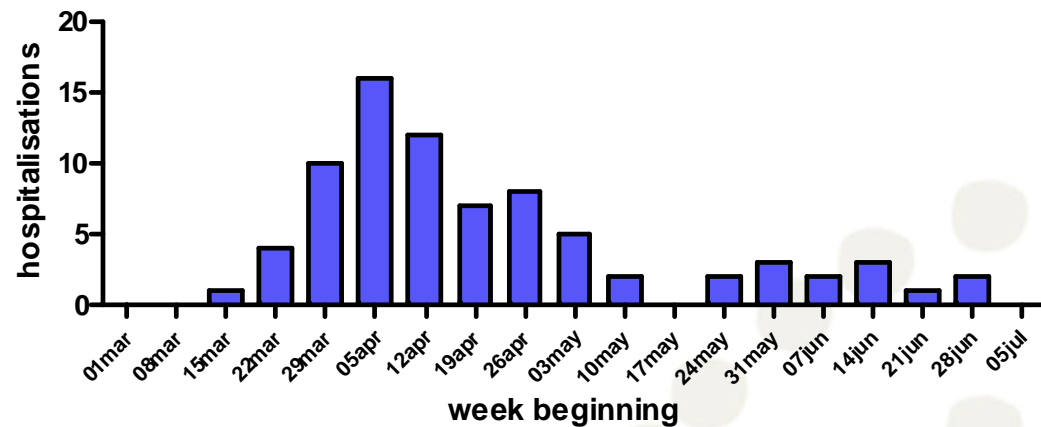
- Inclusion criteria:
  - Younger than 5 years, *and*
  - 3 or more loose stools reported in 24 hours prior to admission *or* the first 24 hours after admission, *and*
  - Gastroenteritis as principle diagnosis on discharge *or* Gastroenteritis as primary reason for admission
  
- Exclusion criteria:
  - Readmissions within 14 days

- Demographic:
  - Age
  - Indigenous status
  - Location of residence
- Clinical severity:
  - Symptom severity score (based on Vesikari)
  - Lowest pH within 24hr of presentation
  - Weight changes: presentation weight versus post rehydration/ premorbid weights
- Immunisation status:
  - NT Immunisation Register/ ACIR data

# 2007 G9P[8] outbreak



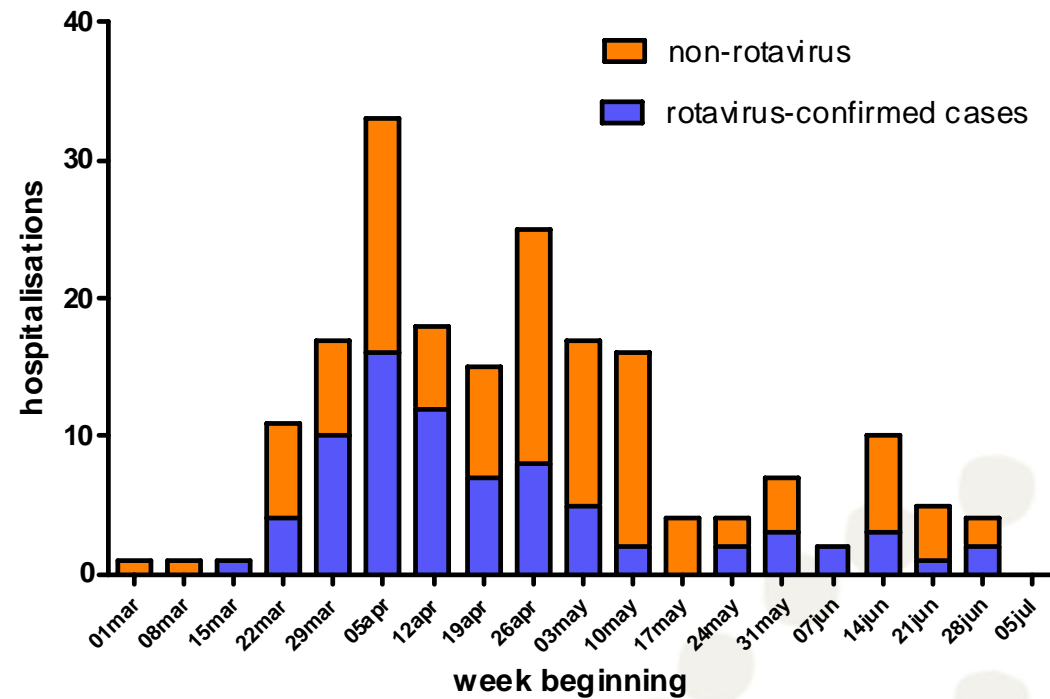
Weekly rotavirus-confirmed admissions, 2007



78 cases RV-confirmed

# 2007 G9P[8] outbreak

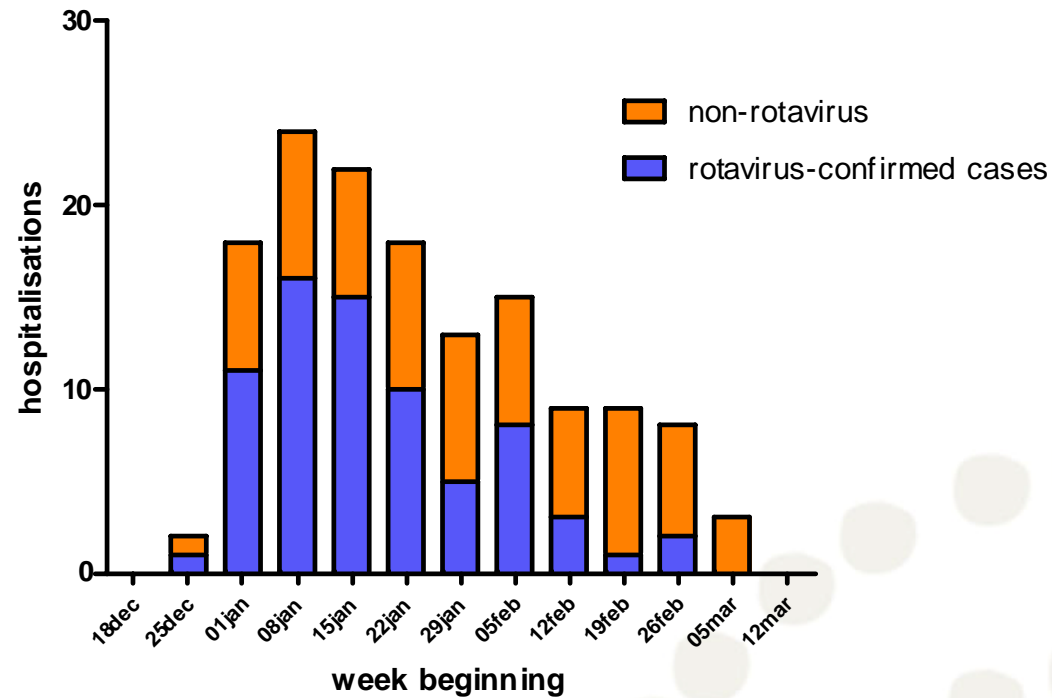
Weekly gastroenteritis hospitalisations, 2007



186 total gastro admissions  
42% RV-confirmed

# 2004 G2P[4] outbreak

Weekly gastroenteritis hospitalisations, 2004



144 total gastro admissions  
49% RV-confirmed

# 2004 versus 2007 cases



	2004	2007	<i>p-value</i>
serotype	G2P[4]	G9P[8]	
Admissions	132	186	
RV-confirmed	49%	42%	0.60
Indigenous	94%	92%	0.50
Urban	31%	26%	0.36
Median LOS	5 days	6 days	0.13
Median age	12.9 months	11.7 months	0.47
Median pH	7.3	7.3	0.81
Median symptom score	12	12	0.97

## Rotavirus-confirmed versus non-rotavirus

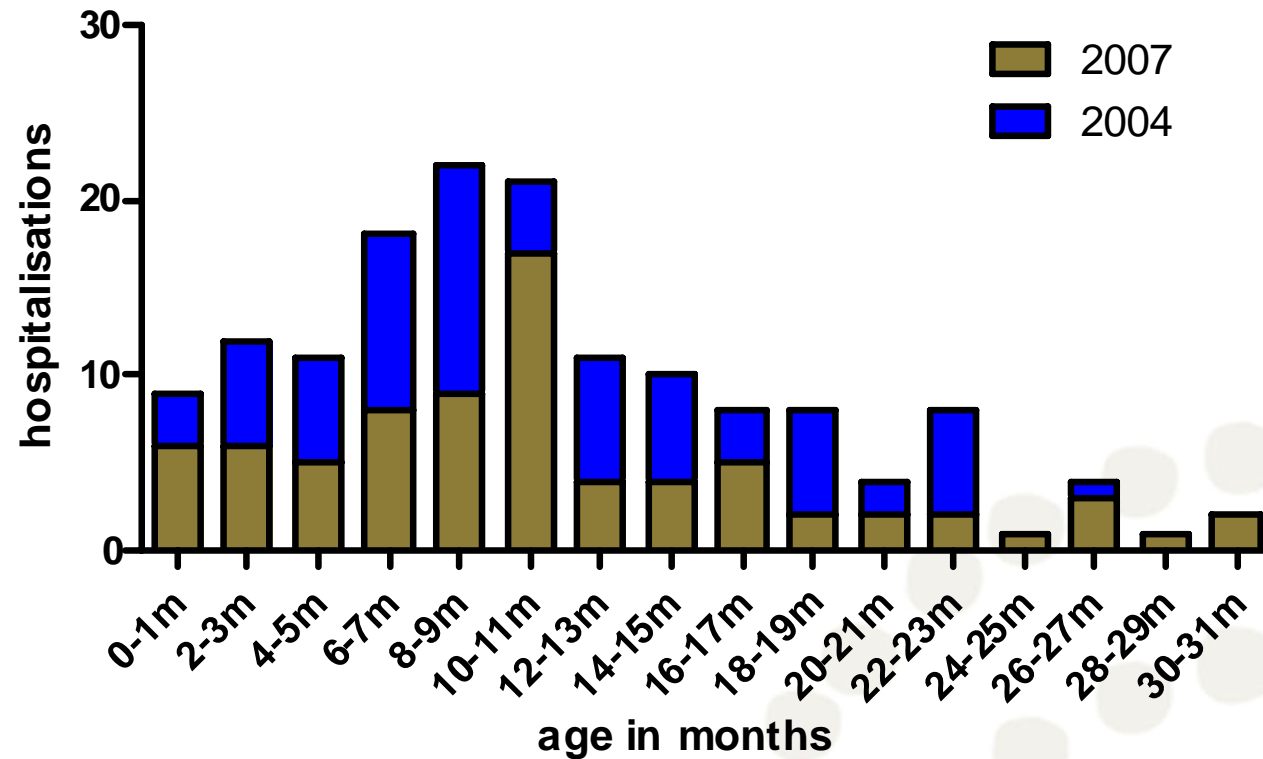


	RV-confirmed	Not RV-confirmed	<i>p-value</i>
Admissions	143	175	
Indigenous	92%	93%	0.78
Urban	30%	27%	0.53
Median LOS (days)	6	5	0.06
Median age (months)	10.2	14.5	0.0005
Median pH	7.27	7.33	0.0001
Median symptom score	13	11	0.0001
Median weight change	4.6%	3.5%	0.022
Alternative pathogen	6%	32%	0.001

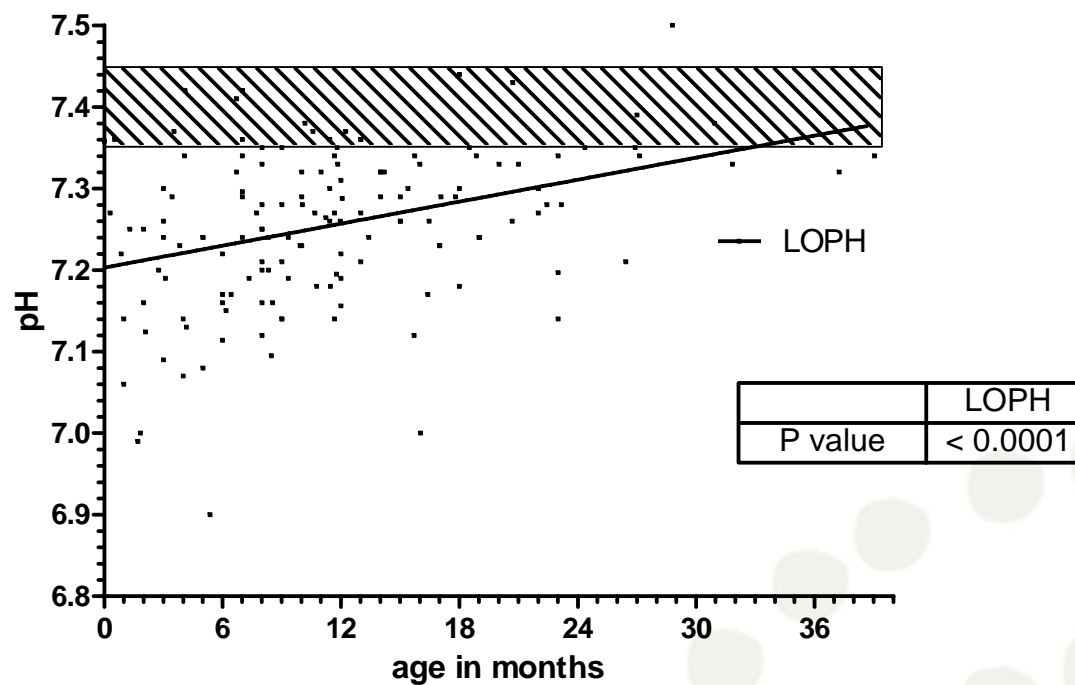
# Age distribution of rotavirus-confirmed cases



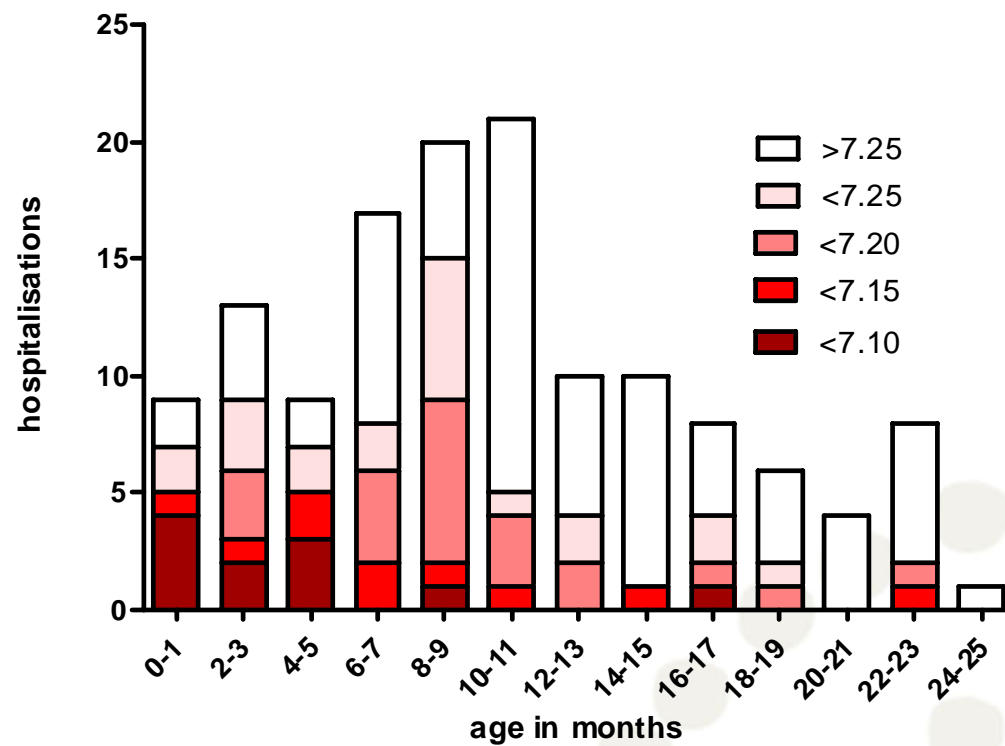
## Rotavirus-confirmed admissions by age



pH vs age for all RV cases



pH vs age for all rotavirus-confirmed cases



# Indigenous vs non-Indigenous RV admissions



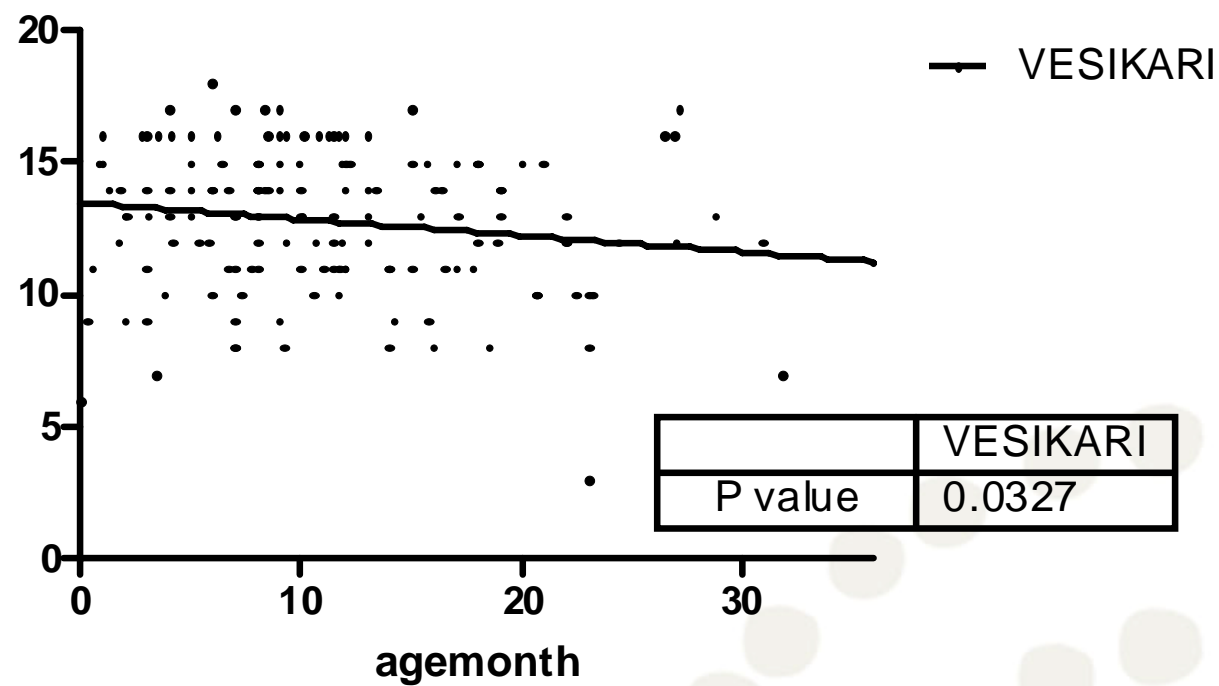
	Indigenous	Non-Indigenous	<i>p-value</i>
admissions	298	23	
RV-confirmed	133	11	
Median LOS (days)	6	2	<0.001
Median age (months)	10.0	17.8	0.026
Median pH	7.26	7.32	0.022
Median symptom score	13	11	0.11
Median weight change	4.9	2.0	0.0059

## Predictors of severe acidosis (pH<7.15)

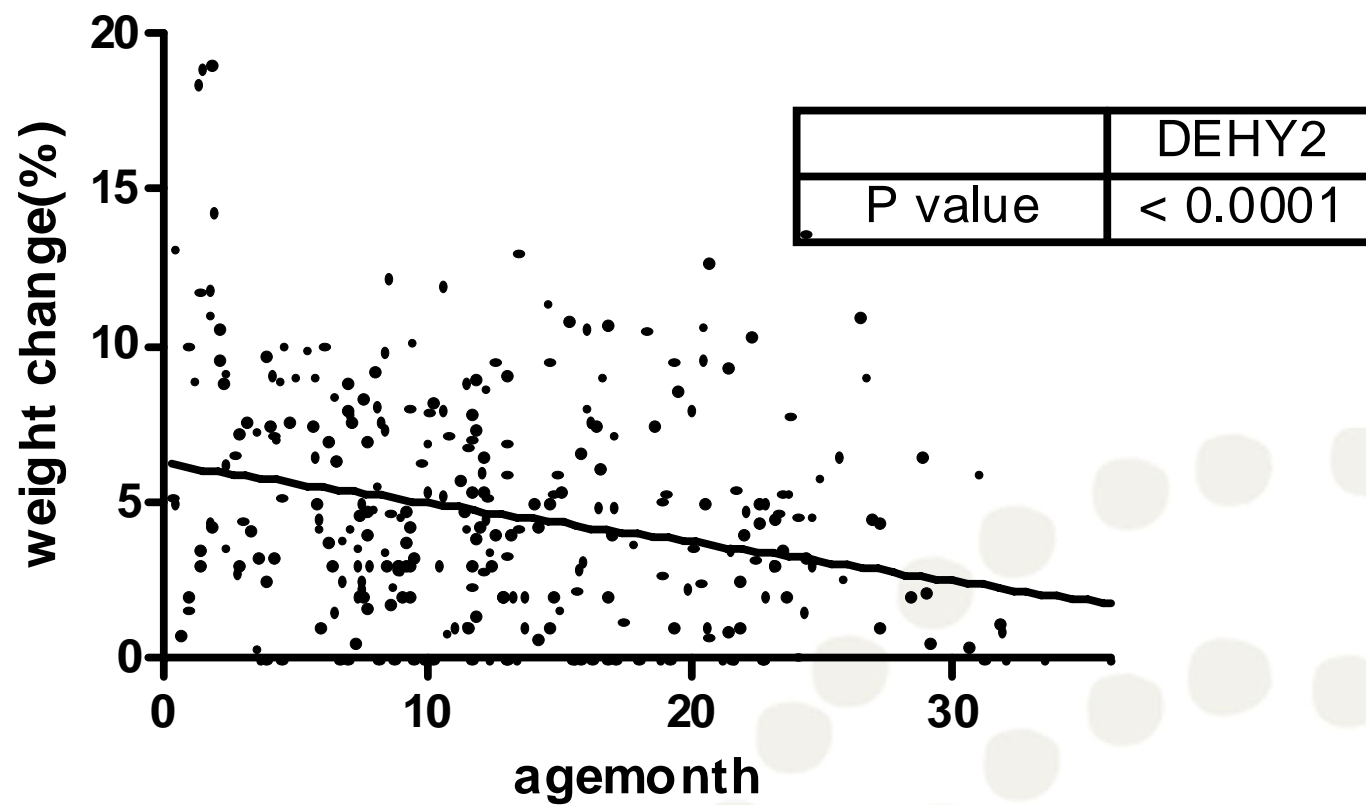


<i>Table 3</i>	<b>Profound acidosis</b>			
	Univariate odds ratio	p-value	Adjusted odds ratio	Confidence interval
Age < 6months	10.6	<0.001	<b>10.7</b>	4.39 to 26.0
Male	0.92	0.88		
urban	0.44	0.14		
rotavirus	3.68	0.004	<b>3.70</b>	1.43 to 9.55
Non-rotavirus pathogen	0.30	0.111		
Vaccinated (at least one dose)	1.80	0.38		
2004 (G2P[4]) epidemic	0.87	0.74		

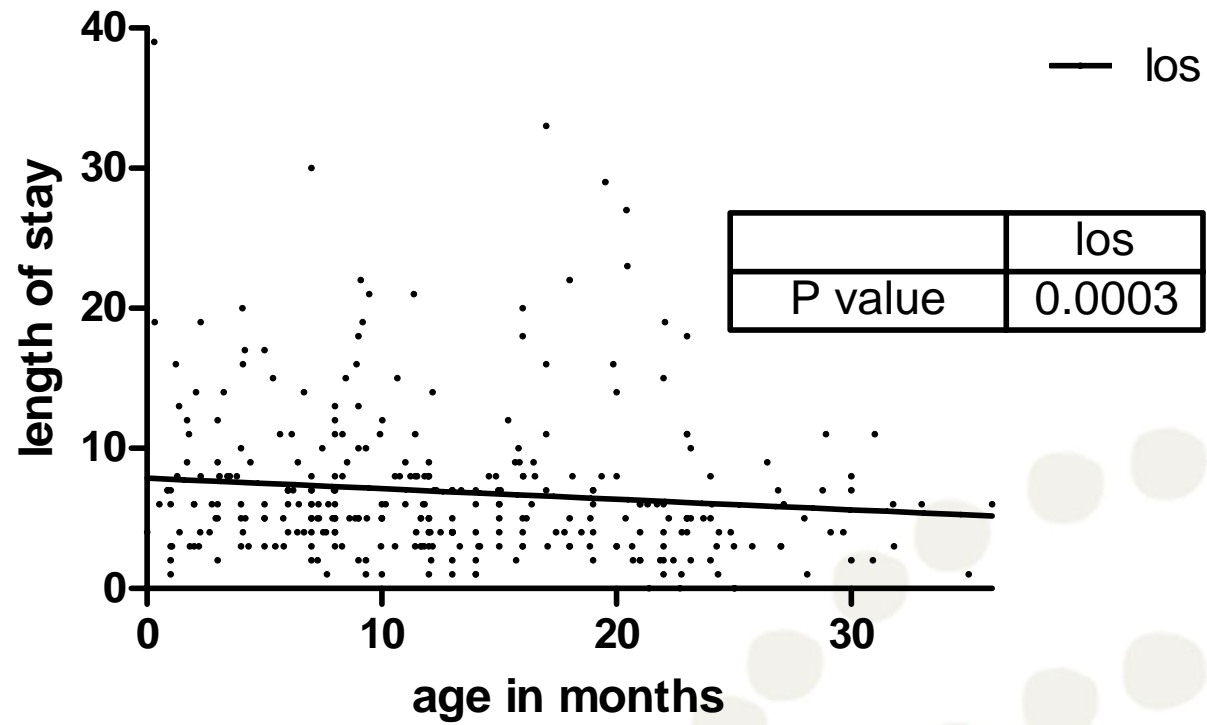
### Symptom score vs age for all RV



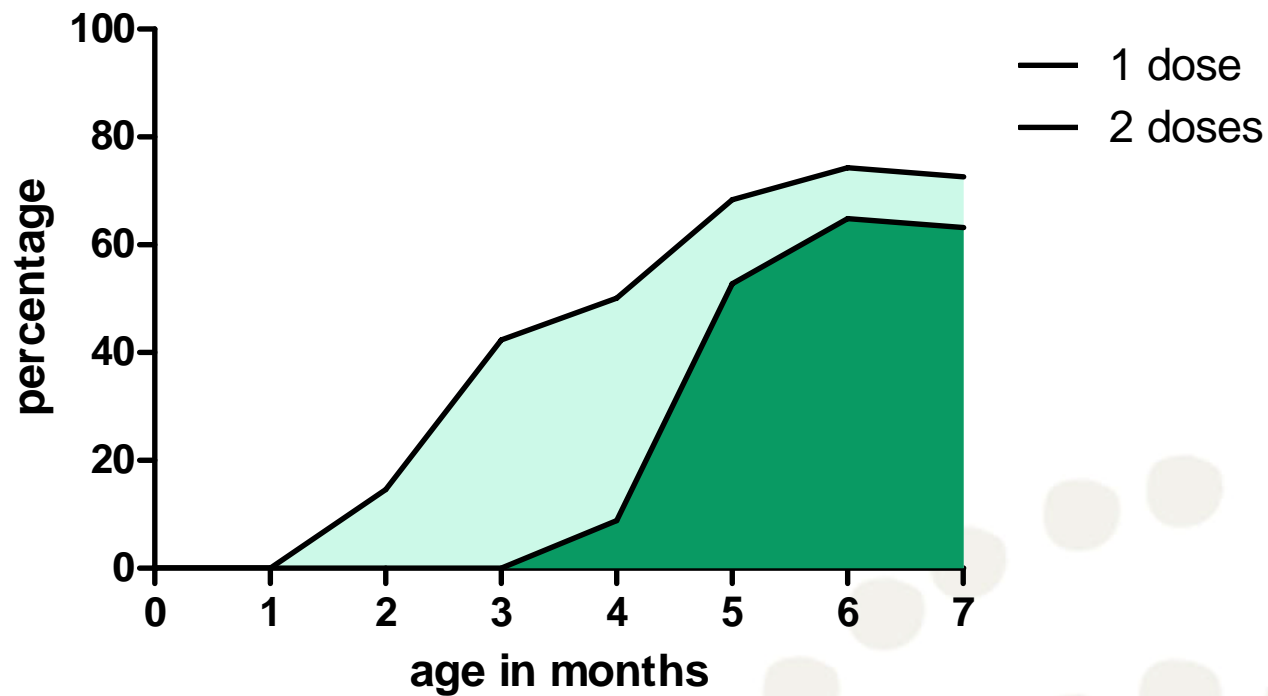
## weight change vs age



### length of stay vs age for all gastro



### vaccine coverage

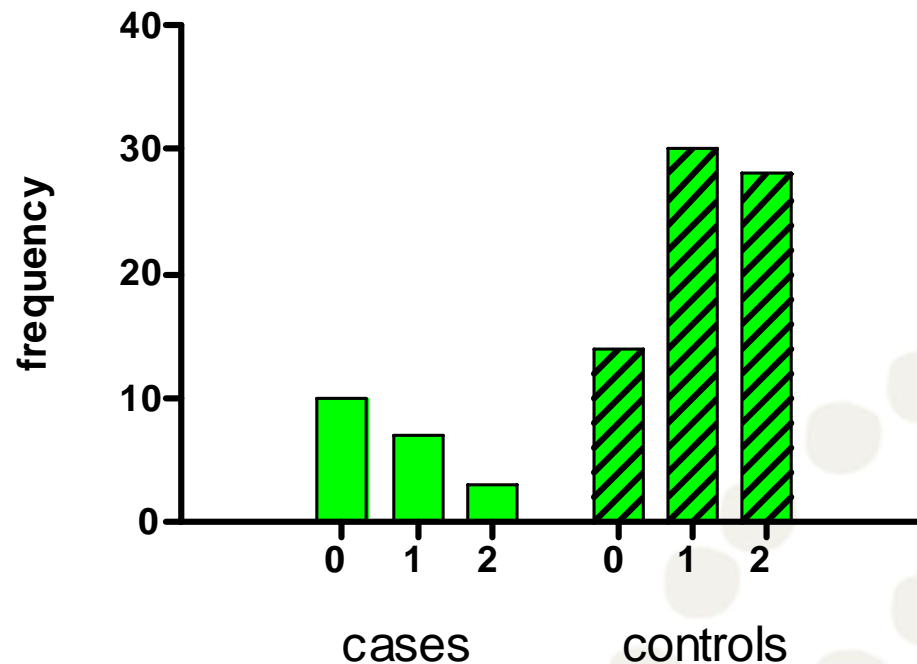


# 2007 epidemic, retrospective case-control



- Each of the 20 cases directly matched by age and urban versus remote residence to (up to) 4 non-hospitalised children on the vaccine register

vaccine status of rotavirus-confirmed cases and matched controls



- VE for 2 doses: 83% (CI: 34 to 96%)
- VE for 1 dose: 54% (CI: -48 to 86%)

## 2007 epidemic, retrospective cohort



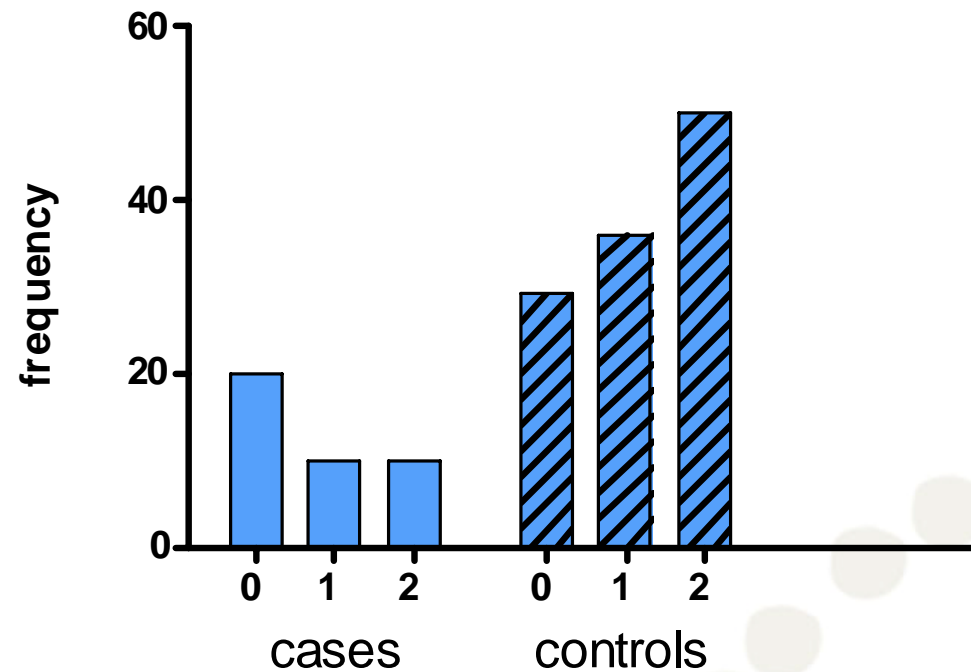
- 403 children born after August 1<sup>st</sup> 2006 and at least 16 weeks old at the time of the first hospitalised case (eligible for 2 doses of vaccine.)

	Vaccinated 2 doses	Vaccinated 1 dose	Non- vaccinated	
Hospitalised	3	6	9	18
Non- hospitalised	155	137	93	385
	158	143	102	403

- VE for 2 doses: 80% (CI: 17 to 97%)
- VE for 1 dose: 55% (CI: -48 to 87%)
- Number needed to vaccinate (2 doses) = 15

# 2007 epidemic, retrospective case-control

vaccine status of all gastroenteritis cases and matched controls



- VE for 2 doses: 79% (CI: 33 to 93%)
- VE for 1 dose: 63% (CI: -5 to 87%)

# Summary



- Admissions during rotavirus outbreaks in central Australia are very common (affected up to 1 in 4 Indigenous infants)
- Rotavirus-negative or non-confirmed gastroenteritis admissions comprise a large proportion of outbreak admissions
- Many admissions are for infants younger than 6 months.
- Moderate to severe acidosis is common, especially amongst infants younger than 6 months.
- Rotavirus vaccination appears to be moderately protective ~80% for 2 doses.
- The NNV is low, especially for Indigenous children
- The challenge is to ensure timely vaccination and high coverage for Indigenous children.

# Special thanks to...

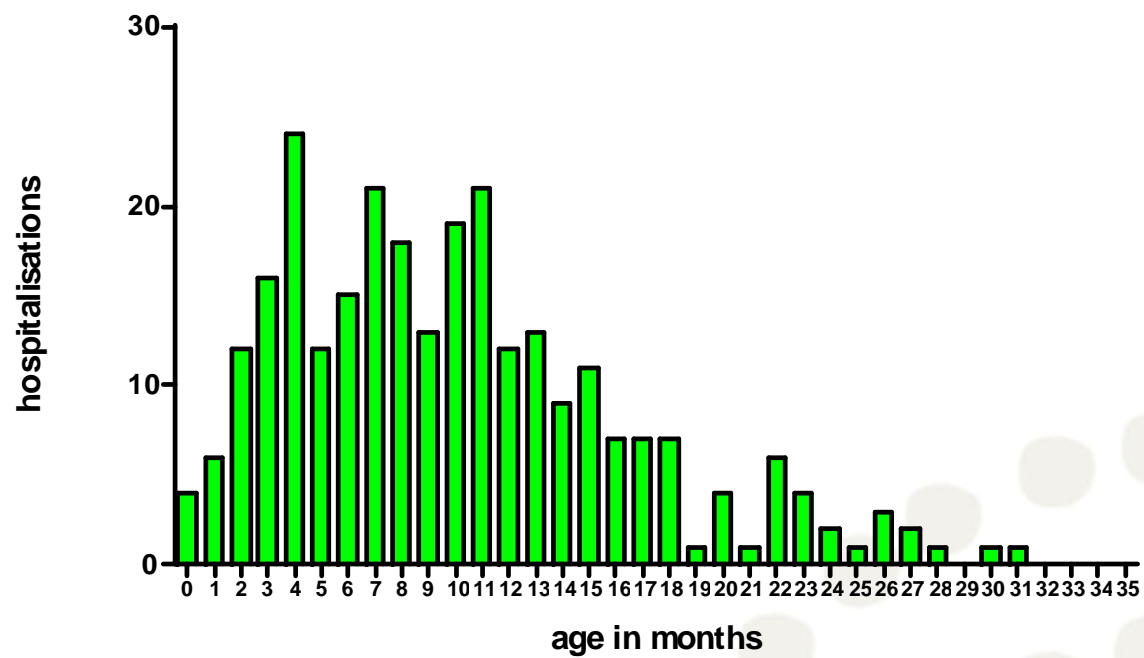


- Rosalie Schultz, CDC, Alice Springs
- John Bethel, Alice Springs Hospital
- Julie Graham, CDC, Darwin
- Rob Roseby, Alice Springs Hospital

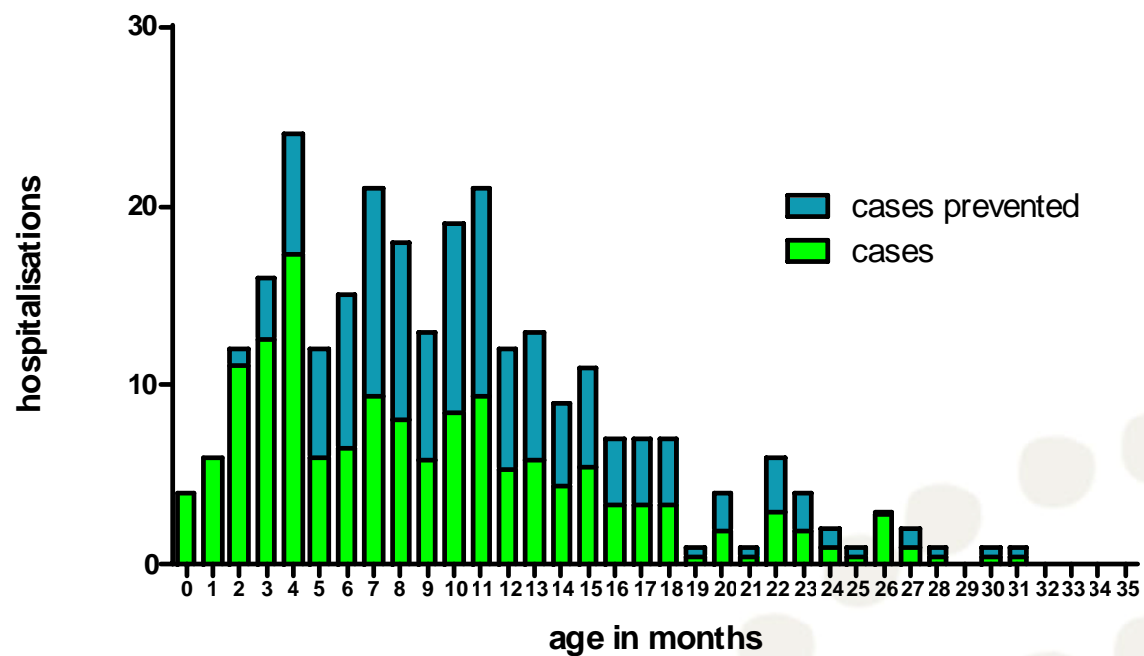


	2 doses Vaccine effectiveness (95% CI)	1 dose Vaccine effectiveness (95% CI)
Rotavirus positive (matched case-control)	<b>83%</b> (34-96%)	54% (-48 to 86%)
Rotavirus positive (retrospective cohort)	<b>80%</b> (17-97%)	55% (-48 to 87%)
All-cause gastroenteritis	<b>79%</b> (39-93%)	63% (-5 to 87%)

Age of hospitalised children: 2001/02/04/07



### Projected cases at 65% coverage and 83% effectiveness



### Projected cases at 80% coverage and 83% effectiveness

