Effectiveness of monovalent rotavirus vaccine against hospitalization with acute rotavirus gastroenteritis in Kenyan children

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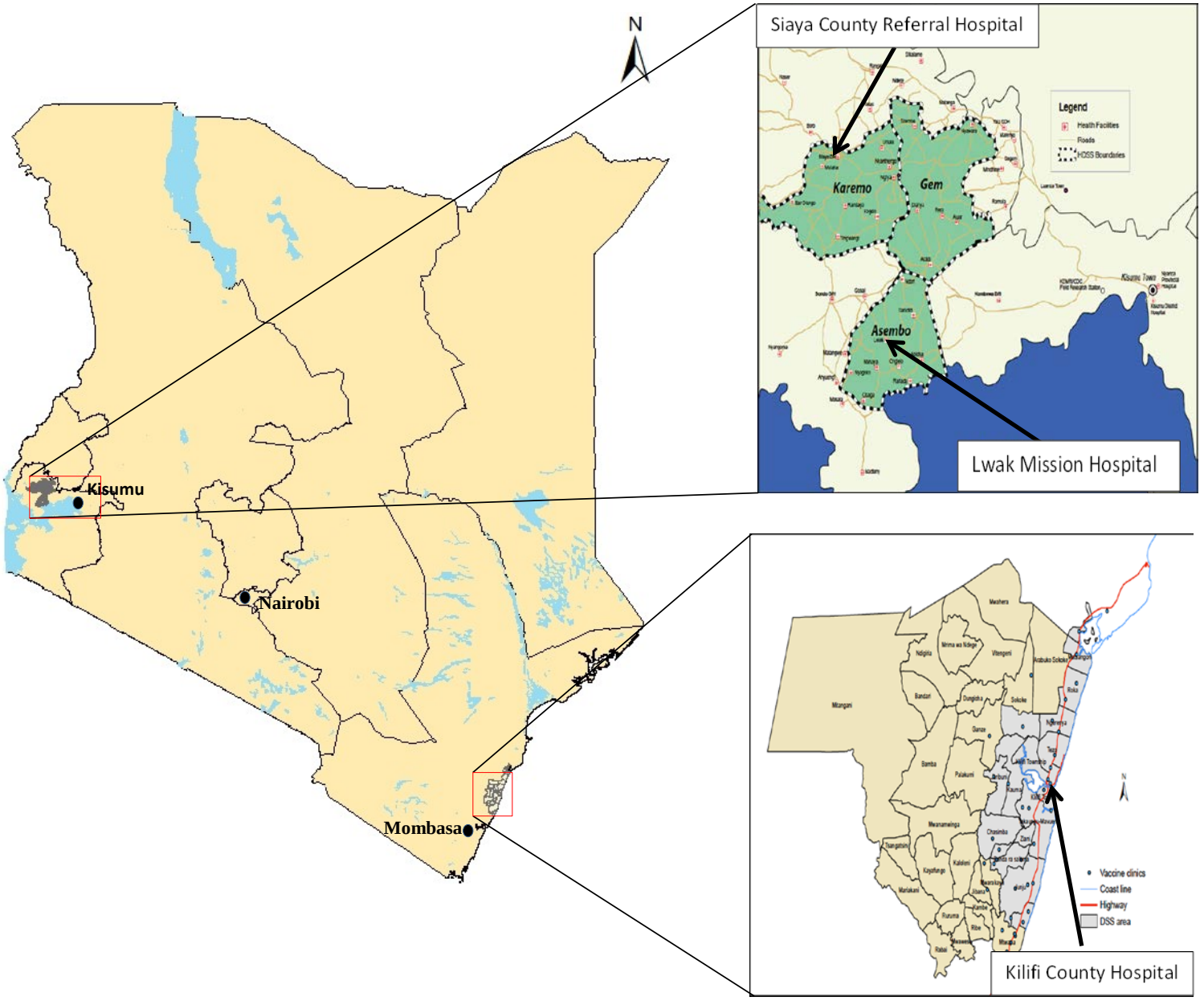
Background

- In Kenya, before rotavirus vaccine introduction, among <5 yr olds, rotavirus responsible;
  - 19% (~9,000) of all hospitalizations with diarrhea
  - 16% (~1.5 million) of all clinic visits
  - > 4,000 deaths a leading cause of severe diarrhea
- Kenya introduced monovalent rotavirus vaccine (RV1) in July 2014
- Rotavirus Immunization Program Evaluation in Kenya (RIPEK) established among institutions with rotavirus disease surveillance platforms
  - Evaluate effectiveness of RV1 against rotavirus diarhoea hospitalization in children <5 years of age in Kenya

RIPEK sites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Kisumu
Nairobi
Mombasa
Siaya County Referral Hospital
Legend
Health Facilities
Floods
HDSS Boundaries
Karemo
Gem
Asembo
Lwak Mission Hospital
Vaccine clinics
Coast line
Highway
DSS area
Kilifi County Hospital

Methods

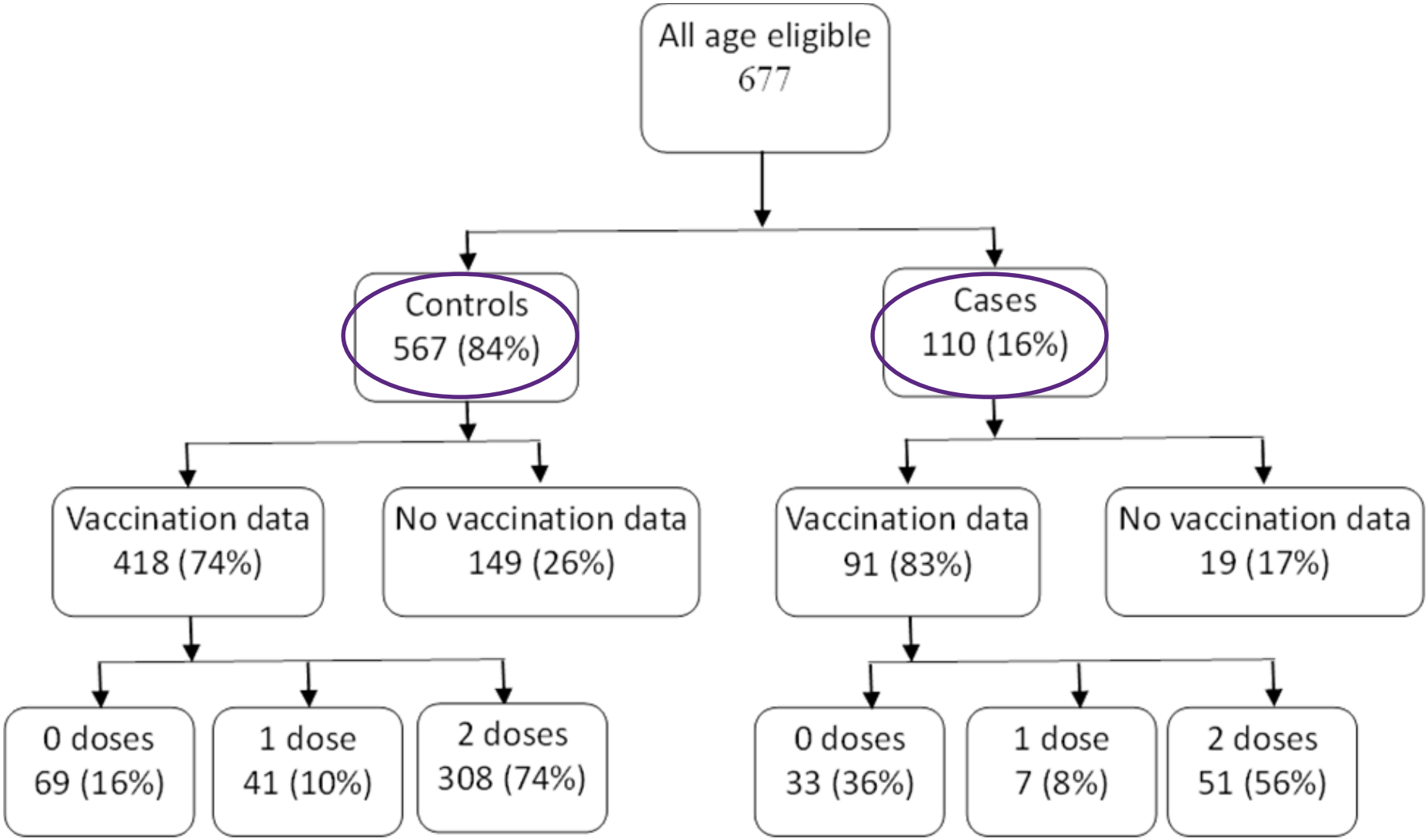
- Children <5 years hospitalized with gastroenteritis at participating facility between July 2014 and Dec 2017 enrolled
- Eligible to have received ≥1 dose of rotavirus vaccine
  - ≥ 8 weeks of age and born 6 weeks before date of vaccine introduction (24th April 2014) or later
- Provided stool specimen for rotavirus testing by ELISA
- Card/registry confirmed vaccination history
  - Dose of rotavirus vaccine considered valid (i.e. immunologically protective) if administered >14 days before admission date

Methods

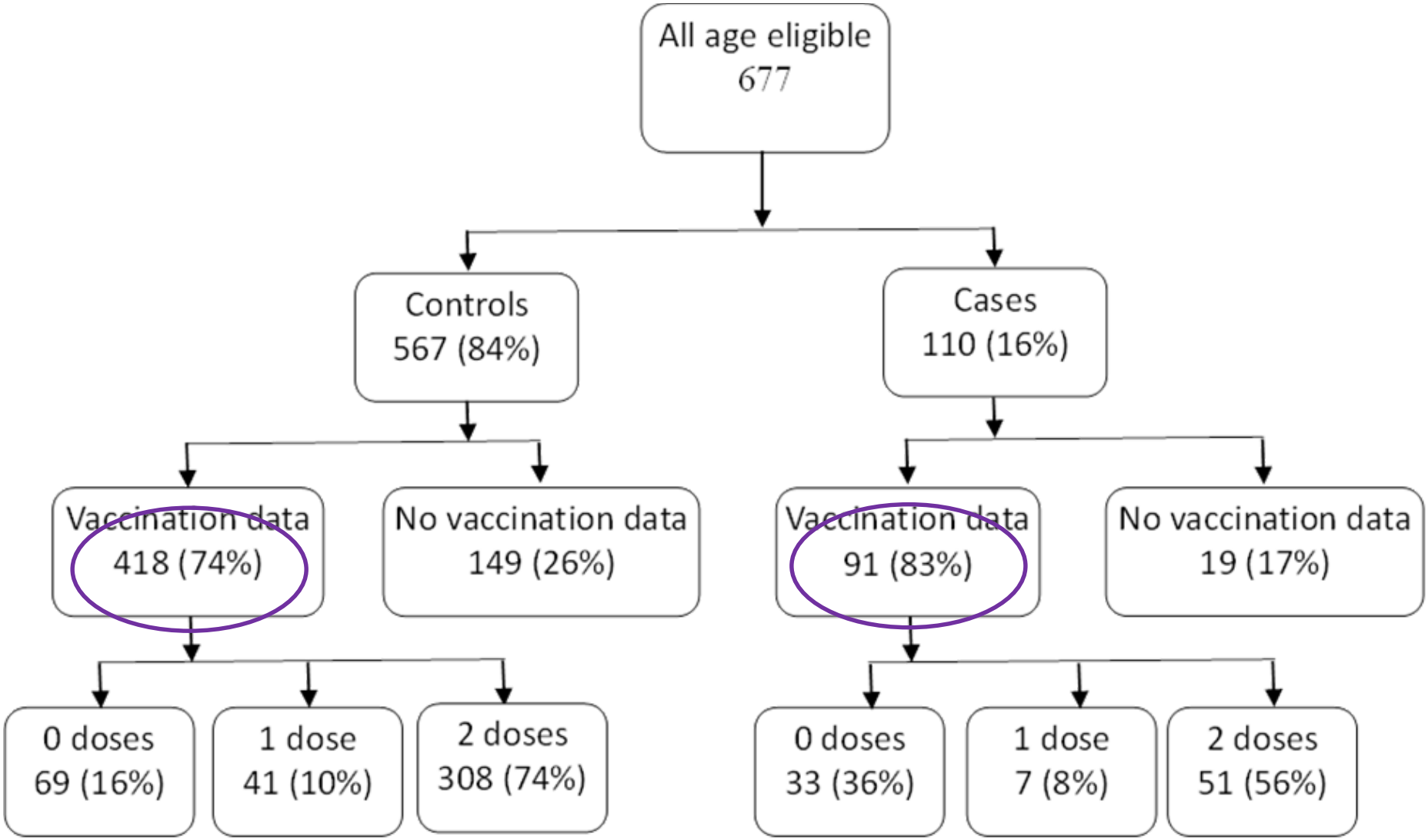
- Case control vaccine-effectiveness using 'Test negative' design
  - **Cases**: rotavirus-positive
  - **Controls**: rotavirus-negative
- Compare vaccination coverage among cases and controls
  - Calculate odds ratio (OR) for RV1 vaccination
  - Adjusted for age in weeks and
  - Assessed for other potential confounders including variables in age/date/site-adjusted model
- Vaccine effectiveness = 1-OR x100%

Results

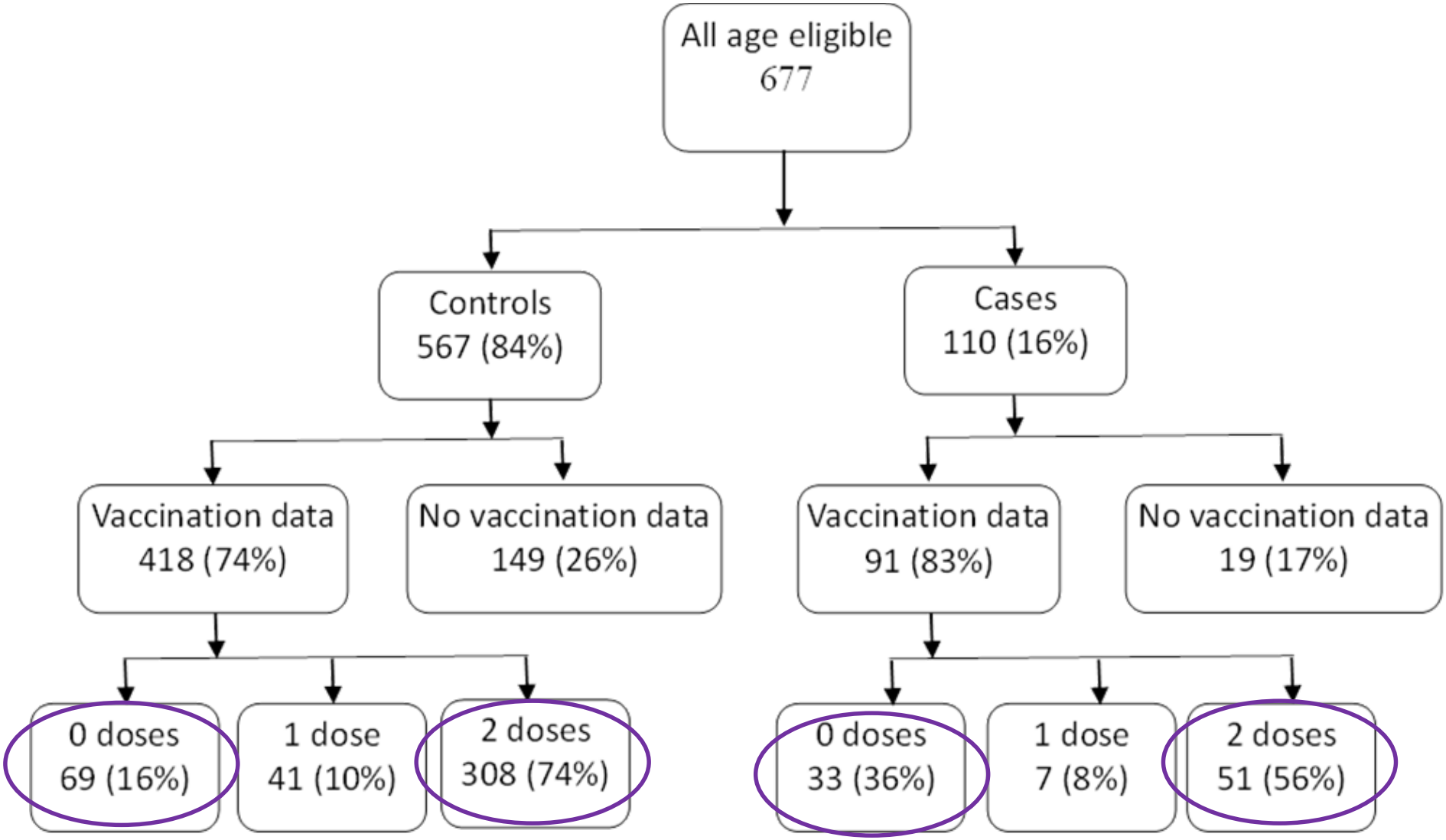
Enrolled participants



Enrolled participants



Enrolled participants



Vaccine effectiveness estimates

	% Vaccinated		Adjusted* VE (95% CI)
	Cases (N=91)	Controls (N=418)	
Dosage			
2 doses	51/83 (61%)	308/365 (84%)	**64% (35% to 80%)**
≥1 doses	58/91 (64%)	349/418 (83%)	**58% (32 to 78%)**

*Adjusted for age in weeks, date of enrollment and site

Vaccine effectiveness estimates

	% Vaccinated		Adjusted* VE (95% CI)
	Cases (N=91)	Controls (N=418)	
Age group			
<12 months	33/55 (60%)	184/218 (84%)	**67% (30 to 84%)**
≥12 months	18/28 (64%)	124/147 (84%)	**72% (10 to 91%)**

*Adjusted for age in weeks, date of enrollment and site

Vaccine effectiveness estimates

	% Vaccinated		Adjusted* VE (95% CI)
	Cases (N=91)	Controls (N=418)	
Study site			
Kilifi	33/58 (57%)	192/237 (81%)	**63% (26 to 82%)**
Siaya	7/14 (47%)	58/67 (79%)	**81% (21 to 96%)**
Lwak	11/11 (100%)	58/61 (95%)	**--**

*Adjusted for age in weeks, date of enrollment and site

Vaccine effectiveness estimates

	% Vaccinated		Adjusted* VE (95% CI)
	Cases (N=91)	Controls (N=418)	
Disease severity (20 point Vesikari score)			
Less severe	34/53 (64%)	206/240 (86%)	**67% (30 to 84%)**
Severe	17/30 (55%)	102/125 (82%)	**61% (-10 to 86%)**

*Adjusted for age in weeks, date of enrollment and site

Vaccine effectiveness estimates

Nutrition status	% Vaccinated		Adjusted* VE (95% CI)
	Cases (N=91)	Controls (N=418)	
Weight for age			
Normal (z score ≥ -2)	28/51 (55%)	184/210 (87%)	**84% (62% to 93%)**
z score <-2	22/31 (70%)	122/152 (80%)	10% (-134% to 66%)
Height for age			
Normal	33/58 (57%)	210/247 (85%)	**75% (48% to 88%)**
z score <-2	17/23 (74%)	98/118 (83%)	28% (-118% to 76%)
Weight for height			
Normal	31/57 (54%)	192/218 (88%)	**84% (64% to 93%)**
z score <-2	19/25 (76%)	112/142 (79%)	-9% (-224% to 63%)

*Adjusted for age in weeks, date of enrollment and site

Vaccine effectiveness estimates

	% Vaccinated		Adjusted** VE (95% CI)
	Cases (N=91)	Controls (N=418)	
Genotypes[ɣ]			
G1P[8]	13/32 (41%)	308/365 (84%)	**60% (3% to 83%)**
G2P[4]	15/18 (83)	308/365 (83%)	29% (-184% to 82%)

*Adjusted for age in weeks, date of enrollment and site

Discussion

- RV1 offers significant protection against rotavirus associated hospitalization
  - Consistent with data emerging from other African countries

- Significant effectiveness among well-nourished children, but not for underweight, stunted or wasted
  - May explain, in part, lower efficacy and effectiveness in low- and middle-income countries compared to high-income settings
  - Kilfi with a lower effectiveness (63%) compared to Siaya (81%) also had higher levels of malnutrition

Discussion

- Observed similar levels of protection among children <12 and ≥12 months
  - Protection extends to second year of life

- Point estimate of VE against G1P[8] was significant for but not for G2P[4]
  - Limited statistical power; important to monitor circulating strains post-introduction

Limitations

- Exclusion of 17% of cases and 26% of controls due to lack of card-confirmed vaccination data
- Included only three sites, two of which are located in the same region; may affect generalizability
- Genotype data only available for a subset of cases, limiting our ability to examine strain-specific VE

Thank you!

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