

THE LANCET

Global Health

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Shrestha S, Gurung M, Amatya P, et al. Effect of the of 10-valent pneumococcal conjugate vaccine in Nepal 4 years after introduction: an observational cohort study. *Lancet Glob Health* 2022; **10**: e1494–504.

SUPPLEMENTARY MATERIAL

Supplementary Sample size description

The study will assess the serotype specific impact of the vaccine on transmission of pneumococci by measuring the change in nasopharyngeal carriage prevalence between the pre- and post-PCV eras. Given that only infants will be immunised, it is estimated that a statistically significant impact on carriage may only be seen after one year in those <12 months of age and after two years in those <24 months of age.

Therefore, we will undertake annual cross-sectional carriage rounds, matched on season of study: a) prior to introduction, b) 12 months following first use of PCV and c) 24 and 36 months following first use of PCV. However, we will focus our analysis on children who would have been eligible for immunisation under 2 years of age in each of the post-vaccination cohorts driven by the sample size calculations below. Each round of the carriage study will have 80% power to detect a 75% reduction in 7/13 serotypes in PCV13 in the age group 6-24 months. From the table below 1151 participants in each round of the study will be sufficient to achieve this aim.

TABLE S1 SAMPLE SIZE CALCULATIONS BASED ON PREVIOUS NEPALESE CARRIAGE DATA FROM 600 HEALTHY CHILDREN

Serotype*	N Children with carriage serotype	% Children (of 600 swabbed)	Expected after vaccination. (75% relative reduction)	% N per round required‡	N Total required to swab
14	25	4.17%	1.04%	407	814
6A	23	3.83%	0.96%	444	888
19F	23	3.83%	0.96%	444	888
23F	20	3.33%	0.83%	512	1024
3	14	2.33%	0.58%	737	1474
6B	14	2.33%	0.58%	737	1474
9V	9	1.50%	0.38%	1151	2302

19A	7	1.17%	0.29%	1479	2958
4	5	0.83%	0.21%	2090	4180
18C & 18C-like	3	0.50%	0.13%	3477	6954
5	1	0.17%	0.04%	10248	20496

* Serotypes 1 and 7F not found in any children; ‡Power = 80% Alpha = 5%

The data from the 1151 children per cohort above will have 80% power (alpha =0.05) to detect an overall reduction of 5 percentage points in rates of children with carriage of at least one VT (from 22% to 17%) or an increase of 5 percentage points (from 38% to 43%) in carriage of at least one NVT serotype.

In addition, cross-sectional carriage studies will be undertaken in those aged 24–60 months to assess the direct and indirect impact of vaccination on carriage of total VT pneumococci and NVT pneumococci. Data from children in this age group could provide an early indication of indirect effects of vaccine, but early after vaccine implementation this cohort will be less sensitive to vaccine impact (as they will have not received the benefit of immunisation). For this reason, we will not undertake a large scale carriage study in those over 24 months of age. This part of the study will have 80% power (alpha =0.05) to detect a 70% reduction in rates of carriage of VT or an increase 60% in carriage of NVT serotypes with a sample size of 152 children (Table 2).

TABLE S2 SAMPLE SIZE FOR ANY VT OR NVT CARRIAGE FROM NEPALESE DATA (600 HEALTHY CHILDREN)

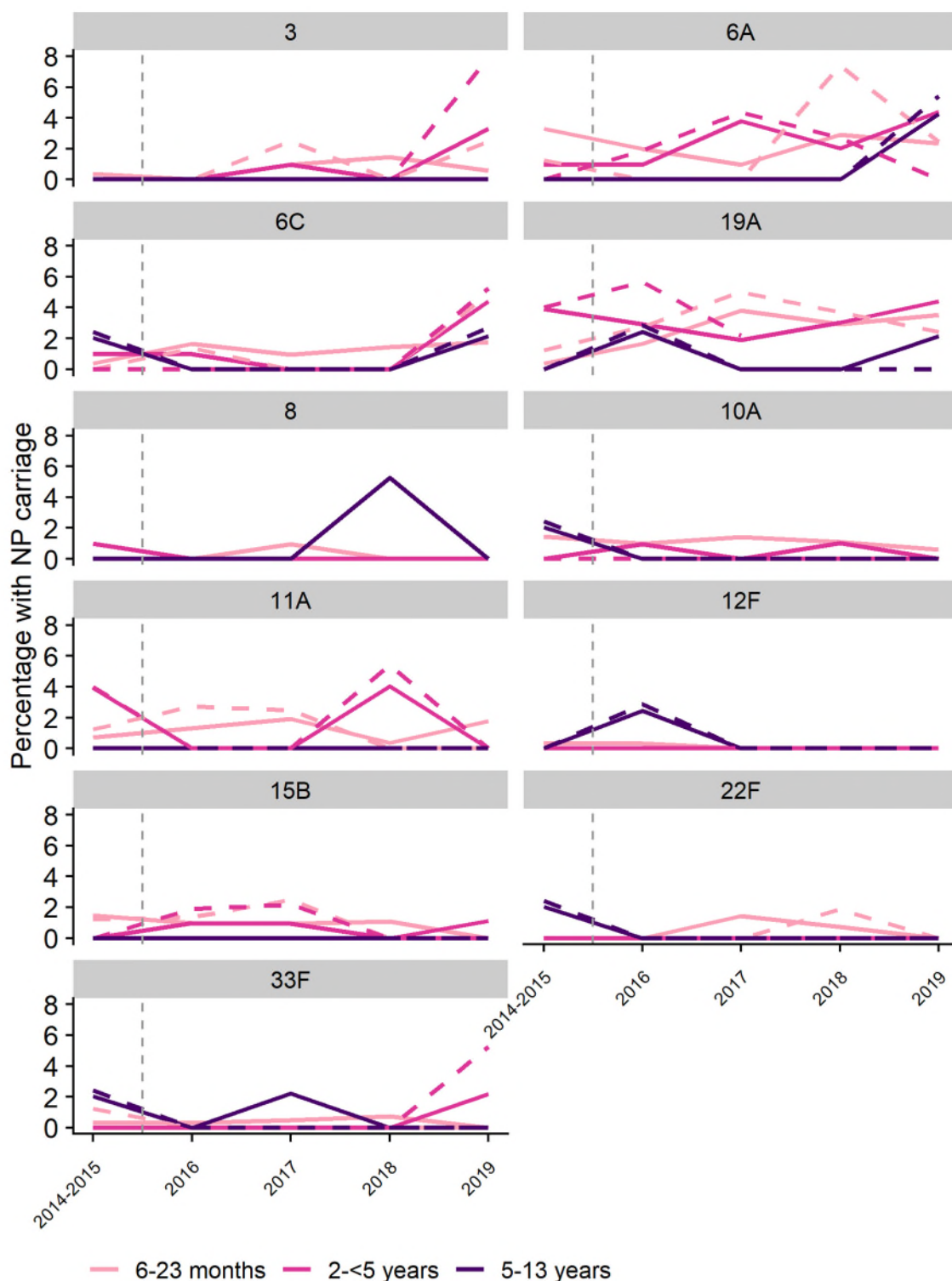
Serotype*	N Children with PCV13 serotype	% Children	Total‡ required for 40% reduction	Total‡ required for 50% reduction	Total‡ required for 60% reduction	Total‡ required for 70% reduction	Total‡ required for 80% reduction
At least one PCV13 VT serotype	133/600	22%	586	356	234	152	106
			Total required for 40% increase	Total required for 50% increase	Total required for 60% increase	Total required for 70% increase	Total required for 80% increase
At least one NVT serotype	226/600	37.6%	342	220	146	104	82

‡Power = 80% Alpha = 5%

TABLE S3 DEMOGRAPHIC CHARACTERISTICS OF HEALTHY COMMUNITY CHILDREN IN URBAN AND RURAL NEPAL

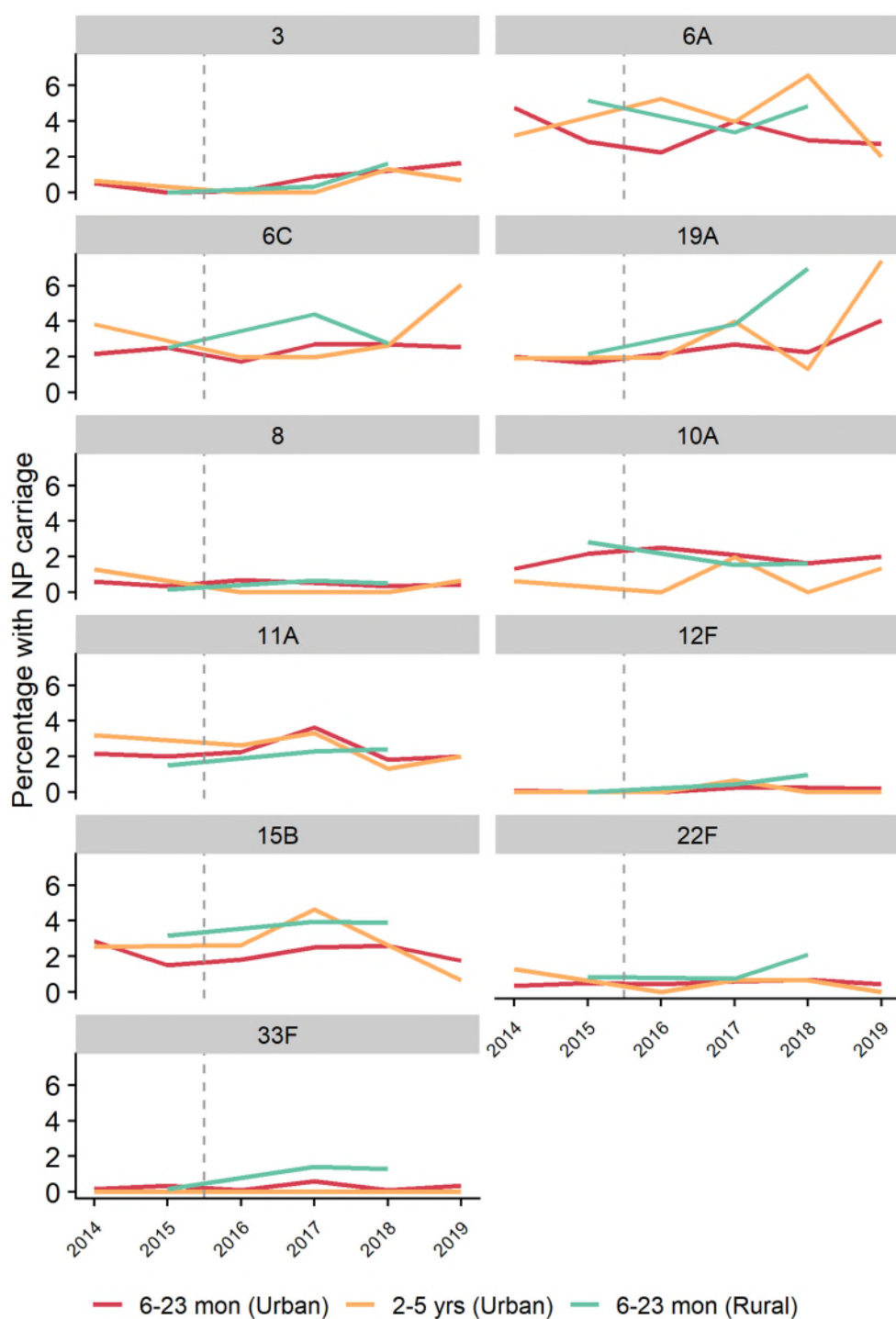
Urban	Age group	2014	2015	2016	2017	2018	2019
Sex (male)	6 to 23 months	646 (49.4%)	329 (55.0%)	644 (49.3%)	621 (47.7%)	614 (46.9%)	658 (51.1%)
Age, years (median IQR)		1.1 (0.8, 1.4)	1.1 (0.8, 1.4)	1.1 (0.9, 1.4)	1.1 (0.9, 1.4)	1 (0.8, 1.3)	1.1 (0.8, 1.3)
Sex (male)	2-5 years	93 (7.1%)		84 (6.4%)	84 (6.5%)	76 (5.8%)	75 (5.8%)
Age, years (median IQR)		2.7 (2.3, 3.5)		2.7 (2.3, 3.4)	2.4 (2.1, 3.2)	2.9 (2.2, 3.8)	2.3 (2.1, 3.4)
Rural							
Sex (male)	6 to 23 months		310 (51.7%)		465 (50.9%)	335 (54.2%)	
Age, years (median IQR)	6 to 23 months		1.3 (0.9, 1.6)		1.3 (0.9, 1.7)	1.2 (0.9, 1.6)	

FIGURE S1 NASOPHARYNGEAL CARRIAGE OF PCV13+ AND PCV20+ ADDITIONAL SEROTYPES OF *S. PNEUMONIAE* AS A PERCENTAGE OF CLINICALLY DIAGNOSED PNEUMONIA CASES (SOLID LINES), OR OF THOSE WITH CHEST RADIOGRAPHS SHOWING CONSOLIDATION (DOTTED LINES)



2014-2015: pre vaccine rollout of PCV10, 2016 – 2019: post-vaccine introduction years. Additional PCV13+ serotypes: 3, 6A, 19A; additional PCV20+ serotypes: 8, 10A, 11A, 12F, 15B, 22F, 33F. 6C is also displayed as a PCV13-related serotype. Dotted vertical line separates pre and post vaccine periods

FIGURE S2 PERCENTAGE OF CHILDREN WITH POSITIVE NASOPHARYNGEAL SWABS FOR THE ADDITIONAL PCV13+ AND PCV20+ SEROTYPES OF *S. PNEUMONIAE* IN HEALTHY URBAN AND RURAL COMMUNITIES IN NEPAL



2014-2015: before introduction of PCV10 vaccine, 2016 – 2019: post-vaccine introduction years.

Dotted vertical line separates pre-vaccine and post-vaccine years. See supplementary file for counts and percentages for all serotypes. Additional PCV13+ serotypes: 3, 6A, 19A; additional PCV20+ serotypes: 8, 10A, 11A, 12F, 15B, 22F, 33F. 6C is also displayed as a PCV13-related serotype.

TABLE S4 NASOPHARYNGEAL CARRIAGE OF *S. PNEUMONIAE* IN HOSPITALISED PNEUMONIA CASES AT PATAN HOSPITAL

* only serotypes occurring more than twice during the study period as shown.

* denominator is the number of cases with clinical discharge diagnosis of pneumonia

Serotype	Age group	Y2014_2015	Y2016	Y2017	Y2018	Y2019
1	Overall	14 (3.3%)	4 (0.9%)	12 (3.4%)	6 (1.6%)	7 (2.3%)
1	6-23 mon	1 (0.4%)	0 (0.0%)	2 (1.0%)	0 (0.0%)	0 (0.0%)
1	2-<5y	4 (4.0%)	2 (2.0%)	4 (3.9%)	3 (3.1%)	1 (1.1%)
1	5+y	9 (18.4%)	2 (5.0%)	6 (13.3%)	3 (15.8%)	6 (12.8%)
4	Overall	1 (0.2%)	2 (0.5%)	2 (0.6%)	1 (0.3%)	0 (0.0%)
4	6-23 mon	1 (0.4%)	0 (0.0%)	0 (0.0%)	1 (0.4%)	0 (0.0%)
4	2-<5y	0 (0.0%)	1 (1.0%)	2 (2.0%)	0 (0.0%)	0 (0.0%)
4	5+y	0 (0.0%)	1 (2.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
5	Overall	2 (0.5%)	6 (1.4%)	4 (1.1%)	2 (0.5%)	1 (0.3%)
5	6-23 mon	0 (0.0%)	1 (0.3%)	0 (0.0%)	1 (0.4%)	0 (0.0%)
5	2-<5y	1 (1.0%)	4 (4.0%)	3 (2.9%)	1 (1.0%)	1 (1.1%)
5	5+y	1 (2.0%)	1 (2.5%)	1 (2.2%)	0 (0.0%)	0 (0.0%)
6B	Overall	5 (1.2%)	2 (0.5%)	1 (0.3%)	3 (0.8%)	0 (0.0%)
6B	6-23 mon	5 (1.8%)	1 (0.3%)	1 (0.5%)	3 (1.1%)	0 (0.0%)
6B	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
6B	5+y	0 (0.0%)	1 (2.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
7F	Overall	2 (0.5%)	1 (0.2%)	1 (0.3%)	1 (0.3%)	2 (0.7%)
7F	6-23 mon	1 (0.4%)	1 (0.3%)	1 (0.5%)	1 (0.4%)	0 (0.0%)
7F	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.1%)
7F	5+y	1 (2.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.1%)
9V	Overall	3 (0.7%)	3 (0.7%)	5 (1.4%)	0 (0.0%)	0 (0.0%)
9V	6-23 mon	1 (0.4%)	2 (0.7%)	1 (0.5%)	0 (0.0%)	0 (0.0%)
9V	2-<5y	1 (1.0%)	1 (1.0%)	4 (3.9%)	0 (0.0%)	0 (0.0%)
9V	5+y	1 (2.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
14	Overall	20 (4.7%)	19 (4.3%)	7 (2.0%)	4 (1.0%)	4 (1.3%)
14	6-23 mon	18 (6.6%)	7 (2.3%)	3 (1.5%)	1 (0.4%)	3 (1.8%)
14	2-<5y	1 (1.0%)	11 (11.0%)	4 (3.9%)	3 (3.1%)	1 (1.1%)
14	5+y	1 (2.0%)	1 (2.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
18C	Overall	1 (0.2%)	3 (0.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
18C	6-23 mon	1 (0.4%)	2 (0.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
18C	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
18C	5+y	0 (0.0%)	1 (2.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
19F	Overall	7 (1.7%)	7 (1.6%)	6 (1.7%)	4 (1.0%)	1 (0.3%)
19F	6-23 mon	6 (2.2%)	6 (2.0%)	1 (0.5%)	4 (1.5%)	0 (0.0%)
19F	2-<5y	1 (1.0%)	1 (1.0%)	4 (3.9%)	0 (0.0%)	1 (1.1%)
19F	5+y	0 (0.0%)	0 (0.0%)	1 (2.2%)	0 (0.0%)	0 (0.0%)
23F	Overall	7 (1.7%)	4 (0.9%)	3 (0.8%)	5 (1.3%)	5 (1.7%)
23F	6-23 mon	7 (2.6%)	4 (1.3%)	3 (1.5%)	2 (0.7%)	1 (0.6%)
23F	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (3.1%)	2 (2.3%)

23F	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (4.3%)
19A	Overall	5 (1.2%)	9 (2.0%)	10 (2.8%)	11 (2.9%)	11 (3.7%)
19A	6-23 mon	1 (0.4%)	5 (1.7%)	8 (3.9%)	8 (3.0%)	6 (3.7%)
19A	2-<5y	4 (4.0%)	3 (3.0%)	2 (2.0%)	3 (3.1%)	4 (4.6%)
19A	5+y	0 (0.0%)	1 (2.5%)	0 (0.0%)	0 (0.0%)	1 (2.1%)
3	Overall	1 (0.2%)	0 (0.0%)	3 (0.8%)	4 (1.0%)	4 (1.3%)
3	6-23 mon	1 (0.4%)	0 (0.0%)	2 (1.0%)	4 (1.5%)	1 (0.6%)
3	2-<5y	0 (0.0%)	0 (0.0%)	1 (1.0%)	0 (0.0%)	3 (3.4%)
3	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
6A	Overall	10 (2.4%)	7 (1.6%)	6 (1.7%)	10 (2.6%)	10 (3.4%)
6A	6-23 mon	9 (3.3%)	6 (2.0%)	2 (1.0%)	8 (3.0%)	4 (2.4%)
6A	2-<5y	1 (1.0%)	1 (1.0%)	4 (3.9%)	2 (2.0%)	4 (4.6%)
6A	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (4.3%)
6C	Overall	3 (0.7%)	6 (1.4%)	2 (0.6%)	4 (1.0%)	8 (2.7%)
6C	6-23 mon	1 (0.4%)	5 (1.7%)	2 (1.0%)	4 (1.5%)	3 (1.8%)
6C	2-<5y	1 (1.0%)	1 (1.0%)	0 (0.0%)	0 (0.0%)	4 (4.6%)
6C	5+y	1 (2.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.1%)
10A	Overall	5 (1.2%)	4 (0.9%)	3 (0.8%)	4 (1.0%)	1 (0.3%)
10A	6-23 mon	4 (1.5%)	3 (1.0%)	3 (1.5%)	3 (1.1%)	1 (0.6%)
10A	2-<5y	0 (0.0%)	1 (1.0%)	0 (0.0%)	1 (1.0%)	0 (0.0%)
10A	5+y	1 (2.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
11A	Overall	6 (1.4%)	4 (0.9%)	4 (1.1%)	5 (1.3%)	3 (1.0%)
11A	6-23 mon	2 (0.7%)	4 (1.3%)	4 (1.9%)	1 (0.4%)	3 (1.8%)
11A	2-<5y	4 (4.0%)	0 (0.0%)	0 (0.0%)	4 (4.1%)	0 (0.0%)
11A	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
12F	Overall	1 (0.2%)	2 (0.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
12F	6-23 mon	1 (0.4%)	1 (0.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
12F	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
12F	5+y	0 (0.0%)	1 (2.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
15B	Overall	4 (0.9%)	4 (0.9%)	3 (0.8%)	3 (0.8%)	1 (0.3%)
15B	6-23 mon	4 (1.5%)	3 (1.0%)	2 (1.0%)	3 (1.1%)	0 (0.0%)
15B	2-<5y	0 (0.0%)	1 (1.0%)	1 (1.0%)	0 (0.0%)	1 (1.1%)
15B	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
22F	Overall	1 (0.2%)	0 (0.0%)	3 (0.8%)	2 (0.5%)	0 (0.0%)
22F	6-23 mon	0 (0.0%)	0 (0.0%)	3 (1.5%)	2 (0.7%)	0 (0.0%)
22F	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
22F	5+y	1 (2.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
33F	Overall	2 (0.5%)	1 (0.2%)	2 (0.6%)	2 (0.5%)	2 (0.7%)
33F	6-23 mon	1 (0.4%)	1 (0.3%)	1 (0.5%)	2 (0.7%)	0 (0.0%)
33F	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (2.3%)
33F	5+y	1 (2.0%)	0 (0.0%)	1 (2.2%)	0 (0.0%)	0 (0.0%)
8	Overall	1 (0.2%)	0 (0.0%)	2 (0.6%)	1 (0.3%)	0 (0.0%)
8	6-23 mon	0 (0.0%)	0 (0.0%)	2 (1.0%)	0 (0.0%)	0 (0.0%)
8	2-<5y	1 (1.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
8	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (5.3%)	0 (0.0%)

10B	Overall	0 (0.0%)	0 (0.0%)	1 (0.3%)	1 (0.3%)	0 (0.0%)
10B	6-23 mon	0 (0.0%)	0 (0.0%)	1 (0.5%)	1 (0.4%)	0 (0.0%)
10B	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
10B	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
13	Overall	5 (1.2%)	4 (0.9%)	0 (0.0%)	5 (1.3%)	2 (0.7%)
13	6-23 mon	5 (1.8%)	3 (1.0%)	0 (0.0%)	3 (1.1%)	0 (0.0%)
13	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (2.0%)	2 (2.3%)
13	5+y	0 (0.0%)	1 (2.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
15A	Overall	1 (0.2%)	3 (0.7%)	2 (0.6%)	3 (0.8%)	3 (1.0%)
15A	6-23 mon	0 (0.0%)	2 (0.7%)	2 (1.0%)	2 (0.7%)	2 (1.2%)
15A	2-<5y	1 (1.0%)	1 (1.0%)	0 (0.0%)	0 (0.0%)	1 (1.1%)
15A	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (5.3%)	0 (0.0%)
15C	Overall	2 (0.5%)	1 (0.2%)	4 (1.1%)	7 (1.8%)	3 (1.0%)
15C	6-23 mon	0 (0.0%)	1 (0.3%)	2 (1.0%)	4 (1.5%)	2 (1.2%)
15C	2-<5y	2 (2.0%)	0 (0.0%)	2 (2.0%)	3 (3.1%)	1 (1.1%)
15C	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
15F	Overall	0 (0.0%)	0 (0.0%)	2 (0.6%)	3 (0.8%)	0 (0.0%)
15F	6-23 mon	0 (0.0%)	0 (0.0%)	2 (1.0%)	2 (0.7%)	0 (0.0%)
15F	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.0%)	0 (0.0%)
15F	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
16F	Overall	1 (0.2%)	1 (0.2%)	3 (0.8%)	1 (0.3%)	0 (0.0%)
16F	6-23 mon	0 (0.0%)	1 (0.3%)	2 (1.0%)	0 (0.0%)	0 (0.0%)
16F	2-<5y	1 (1.0%)	0 (0.0%)	0 (0.0%)	1 (1.0%)	0 (0.0%)
16F	5+y	0 (0.0%)	0 (0.0%)	1 (2.2%)	0 (0.0%)	0 (0.0%)
17F	Overall	1 (0.2%)	1 (0.2%)	0 (0.0%)	5 (1.3%)	5 (1.7%)
17F	6-23 mon	1 (0.4%)	0 (0.0%)	0 (0.0%)	3 (1.1%)	4 (2.4%)
17F	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (2.0%)	1 (1.1%)
17F	5+y	0 (0.0%)	1 (2.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
18A	Overall	0 (0.0%)	2 (0.5%)	0 (0.0%)	1 (0.3%)	0 (0.0%)
18A	6-23 mon	0 (0.0%)	2 (0.7%)	0 (0.0%)	1 (0.4%)	0 (0.0%)
18A	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
18A	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
2	Overall	1 (0.2%)	1 (0.2%)	1 (0.3%)	0 (0.0%)	0 (0.0%)
2	6-23 mon	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
2	2-<5y	0 (0.0%)	1 (1.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
2	5+y	1 (2.0%)	0 (0.0%)	1 (2.2%)	0 (0.0%)	0 (0.0%)
21	Overall	0 (0.0%)	2 (0.5%)	1 (0.3%)	2 (0.5%)	0 (0.0%)
21	6-23 mon	0 (0.0%)	1 (0.3%)	1 (0.5%)	2 (0.7%)	0 (0.0%)
21	2-<5y	0 (0.0%)	1 (1.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
21	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
23A	Overall	0 (0.0%)	2 (0.5%)	1 (0.3%)	8 (2.1%)	2 (0.7%)
23A	6-23 mon	0 (0.0%)	2 (0.7%)	0 (0.0%)	5 (1.9%)	0 (0.0%)
23A	2-<5y	0 (0.0%)	0 (0.0%)	1 (1.0%)	3 (3.1%)	1 (1.1%)
23A	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.1%)
23B	Overall	1 (0.2%)	2 (0.5%)	1 (0.3%)	4 (1.0%)	3 (1.0%)

23B	6-23 mon	1 (0.4%)	2 (0.7%)	0 (0.0%)	4 (1.5%)	2 (1.2%)
23B	2-<5y	0 (0.0%)	0 (0.0%)	1 (1.0%)	0 (0.0%)	1 (1.1%)
23B	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
29	Overall	1 (0.2%)	0 (0.0%)	1 (0.3%)	1 (0.3%)	0 (0.0%)
29	6-23 mon	0 (0.0%)	0 (0.0%)	1 (0.5%)	1 (0.4%)	0 (0.0%)
29	2-<5y	1 (1.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
29	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
31	Overall	0 (0.0%)	2 (0.5%)	2 (0.6%)	3 (0.8%)	0 (0.0%)
31	6-23 mon	0 (0.0%)	2 (0.7%)	2 (1.0%)	3 (1.1%)	0 (0.0%)
31	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
31	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
33B	Overall	0 (0.0%)	3 (0.7%)	0 (0.0%)	1 (0.3%)	0 (0.0%)
33B	6-23 mon	0 (0.0%)	2 (0.7%)	0 (0.0%)	1 (0.4%)	0 (0.0%)
33B	2-<5y	0 (0.0%)	1 (1.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
33B	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
34	Overall	1 (0.2%)	7 (1.6%)	6 (1.7%)	4 (1.0%)	3 (1.0%)
34	6-23 mon	0 (0.0%)	2 (0.7%)	4 (1.9%)	4 (1.5%)	2 (1.2%)
34	2-<5y	1 (1.0%)	5 (5.0%)	2 (2.0%)	0 (0.0%)	0 (0.0%)
34	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (2.1%)
35A	Overall	0 (0.0%)	1 (0.2%)	4 (1.1%)	4 (1.0%)	2 (0.7%)
35A	6-23 mon	0 (0.0%)	1 (0.3%)	4 (1.9%)	3 (1.1%)	1 (0.6%)
35A	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.0%)	1 (1.1%)
35A	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
35B	Overall	3 (0.7%)	1 (0.2%)	4 (1.1%)	2 (0.5%)	4 (1.3%)
35B	6-23 mon	1 (0.4%)	1 (0.3%)	3 (1.5%)	2 (0.7%)	3 (1.8%)
35B	2-<5y	2 (2.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.1%)
35B	5+y	0 (0.0%)	0 (0.0%)	1 (2.2%)	0 (0.0%)	0 (0.0%)
35F	Overall	1 (0.2%)	1 (0.2%)	2 (0.6%)	6 (1.6%)	3 (1.0%)
35F	6-23 mon	1 (0.4%)	1 (0.3%)	2 (1.0%)	3 (1.1%)	2 (1.2%)
35F	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (2.0%)	1 (1.1%)
35F	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (5.3%)	0 (0.0%)
38	Overall	0 (0.0%)	3 (0.7%)	0 (0.0%)	1 (0.3%)	0 (0.0%)
38	6-23 mon	0 (0.0%)	2 (0.7%)	0 (0.0%)	1 (0.4%)	0 (0.0%)
38	2-<5y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
38	5+y	0 (0.0%)	1 (2.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
7B	Overall	1 (0.2%)	1 (0.2%)	0 (0.0%)	1 (0.3%)	1 (0.3%)
7B	6-23 mon	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.6%)
7B	2-<5y	1 (1.0%)	1 (1.0%)	0 (0.0%)	1 (1.0%)	0 (0.0%)
7B	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
7C	Overall	0 (0.0%)	1 (0.2%)	0 (0.0%)	1 (0.3%)	1 (0.3%)
7C	6-23 mon	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.4%)	1 (0.6%)
7C	2-<5y	0 (0.0%)	1 (1.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
7C	5+y	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
NT	Overall	30 (7.1%)	13 (3.0%)	21 (5.9%)	26 (6.8%)	18 (6.0%)
NT	6-23 mon	22 (8.1%)	9 (3.0%)	15 (7.3%)	19 (7.1%)	11 (6.7%)

NT	2-<5y	7 (6.9%)	3 (3.0%)	4 (3.9%)	6 (6.1%)	4 (4.6%)
NT	5+y	1 (2.0%)	1 (2.5%)	2 (4.4%)	1 (5.3%)	3 (6.4%)

TABLE S5 ADJUSTED PREVALENCE RATIOS FOR CARRIAGE OF PNEUMOCOCCAL SEROTYPES IN THOSE WITH CLINICAL DIAGNOSED PNEUMONIA (FIGURE 1)

Figure	Year	Age group	Adj PR	LCL	UCL
1A. Endpoint consolidation on chest radiographs in those clinically diagnosed with pneumonia	2016	< 2years	0.73	0.55	0.98
	2017	< 2years	0.57	0.39	0.81
	2018	< 2years	0.65	0.47	0.89
	2019	< 2years	0.70	0.49	0.997
	2016	2-< 5 years	0.86	0.65	1.13
	2017	2-< 5 years	0.90	0.66	1.21
	2018	2-< 5 years	0.64	0.46	0.90
	2019	2-< 5 years	0.75	0.54	1.03
	2016	5+ years	0.93	0.61	1.42
	2017	5+ years	0.75	0.51	1.10
	2018	5+ years	0.66	0.40	1.10
	2019	5+ years	0.93	0.65	1.33
	2016	Overall	0.84	0.70	1.00
	2017	Overall	0.77	0.64	0.94
	2018	Overall	0.60	0.48	0.74
	2019	Overall	0.87	0.72	1.06
1B. Carriage of a PCV10 serotype in those with clinically diagnosed pneumonia	2016	< 2years	0.57	0.34	0.93
	2017	< 2years	0.38	0.19	0.75
	2018	< 2years	0.33	0.18	0.62
	2019	< 2years	0.18	0.07	0.50
	2016	2-< 5 years	1.84	0.84	4.03
	2017	2-< 5 years	2.76	1.28	5.93
	2018	2-< 5 years	1.21	0.51	2.87
	2019	2-< 5 years	1.04	0.40	2.71
	2016	5+ years	0.60	0.25	1.47
	2017	5+ years	0.66	0.29	1.50
	2018	5+ years	0.62	0.20	1.99
	2019	5+ years	0.80	0.35	1.86
	2016	Overall	0.74	0.51	1.08
	2017	Overall	0.82	0.55	1.20
	2018	Overall	0.50	0.32	0.79
	2019	Overall	0.52	0.32	0.84

1C. Carriage of an additional PCV13+ serotype in those with clinically diagnosed pneumonia					
	2016	< 2years	1.07	0.47	2.44
	2017	< 2years	1.36	0.58	3.16
	2018	< 2years	2.16	1.02	4.56
	2019	< 2years	1.70	0.74	3.91
	2016	2-< 5 years	0.64	0.16	2.59
	2017	2-< 5 years	0.94	0.28	3.16
	2018	2-< 5 years	0.68	0.16	2.84
	2019	2-< 5 years	2.33	0.81	6.69
	2016	5+ years	0.83	0.00	Inf
	2017	5+ years	0.85	0.00	Inf
	2018	5+ years	1.34	0.00	Inf
	2019	5+ years	Inf	0.00	Inf
	2016	Overall	0.90	0.44	1.83
	2017	Overall	1.24	0.62	2.49
	2018	Overall	1.65	0.86	3.13
	2019	Overall	2.17	1.16	4.05
Carriage of an additional PCV20+ serotype in those with clinically diagnosed pneumonia					
	2016	Overall	0.67	0.35	1.29
	2017	Overall	0.91	0.49	1.72
	2018	Overall	0.69	0.36	1.33
	2019	Overall	0.34	0.13	0.90

TABLE S6 PERCENTAGE OF CHILDREN AGED 6 – 23 MONTHS WITH NASOPHARYNGEAL CARRIAGE OF *S.PNEUMONIAE* IN URBAN COMMUNITIES IN NEPAL

Serotype	2014	2015	2016	2017	2018	2019
1	6/1152 (0.52%)	2/598 (0.33%)	1/1154 (0.09%)	3/1150 (0.26%)		1/1139 (0.09%)
4	9/1152 (0.78%)	2/598 (0.33%)	7/1154 (0.61%)	4/1150 (0.35%)	4/1158 (0.35%)	1/1139 (0.09%)
5	1/1152 (0.09%)		2/1154 (0.17%)	1/1150 (0.09%)		1/1139 (0.09%)
6B	49/1152 (4.25%)	25/598 (4.18%)	33/1154 (2.86%)	22/1150 (1.91%)	22/1158 (1.90%)	6/1139 (0.53%)
7F	1/1152 (0.09%)	2/598 (0.33%)	3/1154 (0.26%)	4/1150 (0.35%)	1/1158 (0.09%)	2/1139 (0.18%)
9V	8/1152 (0.69%)	12/598 (2.01%)	13/1154 (1.13%)	11/1150 (0.96%)	8/1158 (0.69%)	4/1139 (0.35%)
14	37/1152 (3.21%)	12/598 (2.01%)	15/1154 (1.30%)	13/1150 (1.13%)	14/1158 (1.21%)	12/1139 (1.05%)
18C	10/1152 (0.87%)	4/598 (0.67%)	8/1154 (0.69%)	6/1150 (0.52%)	6/1158 (0.52%)	3/1139 (0.26%)
19F	63/1152 (5.47%)	23/598 (3.85%)	35/1154 (3.03%)	18/1150 (1.57%)	17/1158 (1.47%)	10/1139 (0.88%)
23F	49/1152 (4.25%)	20/598 (3.34%)	23/1154 (1.99%)	31/1150 (2.70%)	17/1158 (1.47%)	15/1139 (1.32%)
19A	23/1152 (2.00%)	10/598 (1.67%)	25/1154 (2.17%)	31/1150 (2.70%)	26/1158 (2.25%)	46/1139 (4.04%)
3	6/1152 (0.52%)		1/1154 (0.09%)	10/1150 (0.87%)	14/1158 (1.21%)	19/1139 (1.67%)
6A	55/1152 (4.77%)	17/598 (2.84%)	26/1154 (2.25%)	46/1150 (4.00%)	34/1158 (2.94%)	31/1139 (2.72%)
10A	15/1152 (1.30%)	13/598 (2.17%)	29/1154 (2.51%)	24/1150 (2.09%)	19/1158 (1.64%)	23/1139 (2.02%)
11A	25/1152 (2.17%)	12/598 (2.01%)	26/1154 (2.25%)	42/1150 (3.65%)	21/1158 (1.81%)	23/1139 (2.02%)
12F	1/1152 (0.09%)			3/1150 (0.26%)	3/1158 (0.26%)	2/1139 (0.18%)
15B	33/1152 (2.86%)	9/598 (1.51%)	21/1154 (1.82%)	29/1150 (2.52%)	30/1158 (2.59%)	20/1139 (1.76%)
22F	4/1152 (0.35%)	3/598 (0.50%)	5/1154 (0.43%)	7/1150 (0.61%)	8/1158 (0.69%)	5/1139 (0.44%)
33F	2/1152 (0.17%)	2/598 (0.33%)	1/1154 (0.09%)	7/1150 (0.61%)	1/1158 (0.09%)	4/1139 (0.35%)
6C	25/1152 (2.17%)	15/598 (2.51%)	20/1154 (1.73%)	31/1150 (2.70%)	31/1158 (2.68%)	29/1139 (2.55%)
8	7/1152 (0.61%)	2/598 (0.33%)	8/1154 (0.69%)	6/1150 (0.52%)	4/1158 (0.35%)	5/1139 (0.44%)
10B	2/1152 (0.17%)		1/1154 (0.09%)	1/1150 (0.09%)	3/1158 (0.26%)	3/1139 (0.26%)
10F	1/1152 (0.09%)	2/598 (0.33%)	5/1154 (0.43%)	8/1150 (0.70%)	3/1158 (0.26%)	5/1139 (0.44%)
11B	1/1152 (0.09%)		1/1154 (0.09%)		1/1158 (0.09%)	1/1139 (0.09%)
13	17/1152 (1.48%)	4/598 (0.67%)	19/1154 (1.65%)	26/1150 (2.26%)	18/1158 (1.55%)	27/1139 (2.37%)
15A	11/1152 (0.95%)	6/598 (1.00%)	11/1154 (0.95%)	12/1150 (1.04%)	12/1158 (1.04%)	19/1139 (1.67%)

15C	17/1152 (1.48%)	9/598 (1.51%)	26/1154 (2.25%)	32/1150 (2.78%)	21/1158 (1.81%)	12/1139 (1.05%)
15F	2/1152 (0.17%)		1/1154 (0.09%)	3/1150 (0.26%)	4/1158 (0.35%)	6/1139 (0.53%)
16A					2/1158 (0.17%)	9/1139 (0.79%)
16F	13/1152 (1.13%)	2/598 (0.33%)	18/1154 (1.56%)	13/1150 (1.13%)	14/1158 (1.21%)	
17A				3/1150 (0.26%)	7/1158 (0.60%)	5/1139 (0.44%)
17F	6/1152 (0.52%)	6/598 (1.00%)	5/1154 (0.43%)	10/1150 (0.87%)	15/1158 (1.30%)	21/1139 (1.84%)
18A	8/1152 (0.69%)	1/598 (0.17%)	1/1154 (0.09%)	5/1150 (0.43%)		4/1139 (0.35%)
18F	1/1152 (0.09%)	1/598 (0.17%)	5/1154 (0.43%)	1/1150 (0.09%)		1/1139 (0.09%)
19B	5/1152 (0.43%)		9/1154 (0.78%)	10/1150 (0.87%)	6/1158 (0.52%)	10/1139 (0.88%)
2	2/1152 (0.17%)				1/1158 (0.09%)	
20	10/1152 (0.87%)	3/598 (0.50%)	8/1154 (0.69%)	13/1150 (1.13%)	2/1158 (0.17%)	7/1139 (0.61%)
21	5/1152 (0.43%)	4/598 (0.67%)	9/1154 (0.78%)	8/1150 (0.70%)	6/1158 (0.52%)	6/1139 (0.53%)
22A	3/1152 (0.26%)	1/598 (0.17%)	1/1154 (0.09%)	2/1150 (0.17%)		2/1139 (0.18%)
23A	14/1152 (1.22%)	6/598 (1.00%)	9/1154 (0.78%)	13/1150 (1.13%)	12/1158 (1.04%)	10/1139 (0.88%)
23B	4/1152 (0.35%)	4/598 (0.67%)	14/1154 (1.21%)	13/1150 (1.13%)	18/1158 (1.55%)	22/1139 (1.93%)
24A	2/1152 (0.17%)	1/598 (0.17%)	2/1154 (0.17%)	1/1150 (0.09%)		
24F	5/1152 (0.43%)	1/598 (0.17%)	10/1154 (0.87%)	6/1150 (0.52%)	13/1158 (1.12%)	4/1139 (0.35%)
27	1/1152 (0.09%)				1/1158 (0.09%)	1/1139 (0.09%)
28F	3/1152 (0.26%)	3/598 (0.50%)	2/1154 (0.17%)	4/1150 (0.35%)	4/1158 (0.35%)	1/1139 (0.09%)
29	3/1152 (0.26%)	1/598 (0.17%)	4/1154 (0.35%)	4/1150 (0.35%)	4/1158 (0.35%)	3/1139 (0.26%)
31	4/1152 (0.35%)	4/598 (0.67%)	5/1154 (0.43%)	4/1150 (0.35%)	8/1158 (0.69%)	4/1139 (0.35%)
33B	8/1152 (0.69%)	1/598 (0.17%)	21/1154 (1.82%)	7/1150 (0.61%)	14/1158 (1.21%)	8/1139 (0.70%)
33C	5/1152 (0.43%)		2/1154 (0.17%)	1/1150 (0.09%)	1/1158 (0.09%)	
33D	2/1152 (0.17%)	2/598 (0.33%)	1/1154 (0.09%)	1/1150 (0.09%)	1/1158 (0.09%)	5/1139 (0.44%)
34	30/1152 (2.60%)	9/598 (1.51%)	35/1154 (3.03%)	31/1150 (2.70%)	47/1158 (4.06%)	43/1139 (3.78%)
35A	14/1152 (1.22%)	4/598 (0.67%)	12/1154 (1.04%)	25/1150 (2.17%)	28/1158 (2.42%)	16/1139 (1.40%)
35B	18/1152 (1.56%)	5/598 (0.84%)	20/1154 (1.73%)	19/1150 (1.65%)	23/1158 (1.99%)	21/1139 (1.84%)
35C	4/1152 (0.35%)	1/598 (0.17%)	6/1154 (0.52%)		2/1158 (0.17%)	3/1139 (0.26%)
35F	10/1152 (0.87%)	6/598 (1.00%)	9/1154 (0.78%)	7/1150 (0.61%)	16/1158 (1.38%)	18/1139 (1.58%)

37				3/1150 (0.26%)	1/1158 (0.09%)	
38	3/1152 (0.26%)		4/1154 (0.35%)	2/1150 (0.17%)	3/1158 (0.26%)	4/1139 (0.35%)
39	5/1152 (0.43%)	2/598 (0.33%)	5/1154 (0.43%)	4/1150 (0.35%)	6/1158 (0.52%)	6/1139 (0.53%)
42	1/1152 (0.09%)		5/1154 (0.43%)	4/1150 (0.35%)	2/1158 (0.17%)	2/1139 (0.18%)
48	3/1152 (0.26%)		4/1154 (0.35%)	3/1150 (0.26%)	1/1158 (0.09%)	1/1139 (0.09%)
6D	6/1152 (0.52%)	6/598 (1.00%)	6/1154 (0.52%)	2/1150 (0.17%)		3/1139 (0.26%)
7B	10/1152 (0.87%)	3/598 (0.50%)	6/1154 (0.52%)	6/1150 (0.52%)	9/1158 (0.78%)	5/1139 (0.44%)
7C	1/1152 (0.09%)	4/598 (0.67%)	3/1154 (0.26%)	3/1150 (0.26%)	7/1158 (0.60%)	3/1139 (0.26%)
9L	3/1152 (0.26%)			1/1150 (0.09%)		1/1139 (0.09%)
9N	2/1152 (0.17%)	2/598 (0.33%)	1/1154 (0.09%)	1/1150 (0.09%)	2/1158 (0.17%)	1/1139 (0.09%)
NT	72/1152 (6.25%)	38/598 (6.35%)	93/1154 (8.06%)	64/1150 (5.57%)	60/1158 (5.18%)	56/1139 (4.92%)

*Serotypes that occur less than 3 times are not reported.

TABLE S7 PERCENTAGE OF CHILDREN AGED 24-59 MONTHS WITH NASOPHARYNGEAL CARRIAGE OF *S.PNEUMONIAE* IN URBAN COMMUNITIES IN NEPAL

Serotype	2014	2016	2017	2018	2019
1			2/151 (1.32%)		
14	7/157 (4.46%)	8/152 (5.26%)	7/151 (4.64%)	3/152 (1.97%)	2/149 (1.34%)
18C	3/157 (1.91%)	1/152 (0.66%)		2/152 (1.32%)	
19F	6/157 (3.82%)	5/152 (3.29%)	3/151 (1.99%)	2/152 (1.32%)	4/149 (2.68%)
23F	5/157 (3.18%)	4/152 (2.63%)	3/151 (1.99%)	3/152 (1.97%)	6/149 (4.03%)
4		2/152 (1.32%)		1/152 (0.66%)	
5	1/157 (0.64%)	3/152 (1.97%)		1/152 (0.66%)	
6B	6/157 (3.82%)	6/152 (3.95%)	5/151 (3.31%)		1/149 (0.67%)
7F					1/149 (0.67%)
9V	1/157 (0.64%)	2/152 (1.32%)	2/151 (1.32%)	1/152 (0.66%)	1/149 (0.67%)
19A	3/157 (1.91%)	3/152 (1.97%)	6/151 (3.97%)	2/152 (1.32%)	11/149 (7.38%)
3	1/157 (0.64%)			2/152 (1.32%)	1/149 (0.67%)
6A	5/157 (3.18%)	8/152 (5.26%)	6/151 (3.97%)	10/152 (6.58%)	3/149 (2.01%)
10A	1/157 (0.64%)		3/151 (1.99%)		2/149 (1.34%)
11A	5/157 (3.18%)	4/152 (2.63%)	5/151 (3.31%)	2/152 (1.32%)	3/149 (2.01%)
15B	4/157 (2.55%)	4/152 (2.63%)	7/151 (4.64%)	4/152 (2.63%)	1/149 (0.67%)
22F	2/157 (1.27%)		1/151 (0.66%)	1/152 (0.66%)	
6C	6/157 (3.82%)	3/152 (1.97%)	3/151 (1.99%)	4/152 (2.63%)	9/149 (6.04%)
8	2/157 (1.27%)				1/149 (0.67%)
10B			3/151 (1.99%)	1/152 (0.66%)	
10F		3/152 (1.97%)			
13		5/152 (3.29%)	1/151 (0.66%)	3/152 (1.97%)	
15A	3/157 (1.91%)	1/152 (0.66%)	1/151 (0.66%)	1/152 (0.66%)	3/149 (2.01%)
15C		2/152 (1.32%)	4/151 (2.65%)	6/152 (3.95%)	6/149 (4.03%)
15F			1/151 (0.66%)	1/152 (0.66%)	
16F		2/152 (1.32%)	4/151 (2.65%)	1/152 (0.66%)	

17F			1/151 (0.66%)	1/152 (0.66%)	1/149 (0.67%)
18A	3/157 (1.91%)	2/152 (1.32%)			1/149 (0.67%)
19B		4/152 (2.63%)	2/151 (1.32%)		
20	2/157 (1.27%)	1/152 (0.66%)	1/151 (0.66%)		1/149 (0.67%)
21	1/157 (0.64%)	3/152 (1.97%)	1/151 (0.66%)		
23A			2/151 (1.32%)	2/152 (1.32%)	4/149 (2.68%)
23B	2/157 (1.27%)	1/152 (0.66%)	1/151 (0.66%)	3/152 (1.97%)	7/149 (4.70%)
24F	3/157 (1.91%)		1/151 (0.66%)	2/152 (1.32%)	
25A		1/152 (0.66%)			1/149 (0.67%)
28F		1/152 (0.66%)	1/151 (0.66%)		
31		1/152 (0.66%)		2/152 (1.32%)	
33B	1/157 (0.64%)	1/152 (0.66%)	3/151 (1.99%)	2/152 (1.32%)	
34	9/157 (5.73%)	4/152 (2.63%)	2/151 (1.32%)	6/152 (3.95%)	3/149 (2.01%)
35A		1/152 (0.66%)	2/151 (1.32%)	1/152 (0.66%)	1/149 (0.67%)
35B	5/157 (3.18%)	1/152 (0.66%)	1/151 (0.66%)		2/149 (1.34%)
35F	2/157 (1.27%)			2/152 (1.32%)	
38			1/151 (0.66%)	2/152 (1.32%)	1/149 (0.67%)
6D	1/157 (0.64%)		1/151 (0.66%)		
7B				3/152 (1.97%)	1/149 (0.67%)
7C		1/152 (0.66%)		1/152 (0.66%)	1/149 (0.67%)
NT	10/157 (6.37%)	10/152 (6.58%)	12/151 (7.95%)	14/152 (9.21%)	12/149 (8.05%)

*Non-vaccine serotypes that were only detected once are not shown

TABLE S8 PERCENTAGE OF CHILDREN AGED 6-23 MONTHS WITH NASOPHARYNGEAL CARRIAGE OF *S.PNEUMONIAE* IN RURAL COMMUNITIES IN NEPAL

Serotype	2015	2017	2018
1	9/600 (1.50%)	1/914 (0.11%)	
4	3/600 (0.50%)	1/914 (0.11%)	1/618 (0.16%)
5	1/600 (0.17%)		
6B	39/600 (6.50%)	26/914 (2.84%)	12/618 (1.94%)
7F	1/600 (0.17%)	7/914 (0.77%)	1/618 (0.16%)
9V	12/600 (2.00%)	12/914 (1.31%)	4/618 (0.65%)
14	28/600 (4.67%)	20/914 (2.19%)	8/618 (1.29%)
18C	12/600 (2.00%)	4/914 (0.44%)	1/618 (0.16%)
19F	39/600 (6.50%)	14/914 (1.53%)	14/618 (2.27%)
23F	22/600 (3.67%)	13/914 (1.42%)	10/618 (1.62%)
19A	13/600 (2.17%)	35/914 (3.83%)	43/618 (6.96%)
3		3/914 (0.33%)	10/618 (1.62%)
6A	31/600 (5.17%)	31/914 (3.39%)	30/618 (4.85%)
10A	17/600 (2.83%)	14/914 (1.53%)	10/618 (1.62%)
11A	9/600 (1.50%)	21/914 (2.30%)	15/618 (2.43%)
12F		4/914 (0.44%)	6/618 (0.97%)
15B	19/600 (3.17%)	36/914 (3.94%)	24/618 (3.88%)
22F	5/600 (0.83%)	7/914 (0.77%)	13/618 (2.10%)
33F	1/600 (0.17%)	13/914 (1.42%)	8/618 (1.29%)
6C	15/600 (2.50%)	40/914 (4.38%)	17/618 (2.75%)
8	1/600 (0.17%)	6/914 (0.66%)	3/618 (0.49%)
10B	3/600 (0.50%)	5/914 (0.55%)	7/618 (1.13%)
10F		1/914 (0.11%)	3/618 (0.49%)
12A			2/618 (0.32%)
13	10/600 (1.67%)	22/914 (2.41%)	16/618 (2.59%)
15A	13/600 (2.17%)	27/914 (2.95%)	19/618 (3.07%)
15C	17/600 (2.83%)	19/914 (2.08%)	21/618 (3.40%)
15F		1/914 (0.11%)	3/618 (0.49%)
16A	2/600 (0.33%)		
16F	7/600 (1.17%)	8/914 (0.88%)	9/618 (1.46%)
17A		2/914 (0.22%)	
17F	2/600 (0.33%)	10/914 (1.09%)	7/618 (1.13%)
18A	1/600 (0.17%)	3/914 (0.33%)	2/618 (0.32%)
18B	5/600 (0.83%)	3/914 (0.33%)	
19B	3/600 (0.50%)	11/914 (1.20%)	18/618 (2.91%)
2		2/914 (0.22%)	1/618 (0.16%)
20	4/600 (0.67%)	5/914 (0.55%)	2/618 (0.32%)
21	7/600 (1.17%)	16/914 (1.75%)	10/618 (1.62%)
22A		4/914 (0.44%)	3/618 (0.49%)
23A	5/600 (0.83%)	36/914 (3.94%)	19/618 (3.07%)
23B	4/600 (0.67%)	8/914 (0.88%)	3/618 (0.49%)

24A	2/600 (0.33%)	1/914 (0.11%)	
24F		14/914 (1.53%)	
28A		1/914 (0.11%)	1/618 (0.16%)
28F	1/600 (0.17%)	4/914 (0.44%)	6/618 (0.97%)
29	1/600 (0.17%)	2/914 (0.22%)	2/618 (0.32%)
31	2/600 (0.33%)	6/914 (0.66%)	9/618 (1.46%)
33B	3/600 (0.50%)	12/914 (1.31%)	11/618 (1.78%)
33C		3/914 (0.33%)	2/618 (0.32%)
33D	2/600 (0.33%)	2/914 (0.22%)	
34	27/600 (4.50%)	42/914 (4.60%)	37/618 (5.99%)
35A	5/600 (0.83%)	16/914 (1.75%)	6/618 (0.97%)
35B	14/600 (2.33%)	22/914 (2.41%)	25/618 (4.05%)
35C	5/600 (0.83%)	3/914 (0.33%)	1/618 (0.16%)
35F	5/600 (0.83%)	15/914 (1.64%)	16/618 (2.59%)
36	1/600 (0.17%)	1/914 (0.11%)	
37	1/600 (0.17%)		1/618 (0.16%)
38	5/600 (0.83%)	8/914 (0.88%)	4/618 (0.65%)
39	2/600 (0.33%)	5/914 (0.55%)	
40			2/618 (0.32%)
48		1/914 (0.11%)	3/618 (0.49%)
6D	3/600 (0.50%)	2/914 (0.22%)	
7A	2/600 (0.33%)		
7B		5/914 (0.55%)	5/618 (0.81%)
7C	5/600 (0.83%)	13/914 (1.42%)	4/618 (0.65%)
9L	2/600 (0.33%)		
9N	1/600 (0.17%)	2/914 (0.22%)	1/618 (0.16%)
NT	35/600 (5.83%)	77/914 (8.42%)	47/618 (7.61%)

TABLE S9 PERCENTAGE OF CHILDREN WITH NASOPHARYNGEAL CARRIAGE OF ANY *S.PNEUMONIAE* SEROTYPE IN URBAN AND RURAL COMMUNITIES IN NEPAL

	2014	2015	2016	2017	2018	2019
Urban age <2y						
<i>Any</i>	776/1152 (67.36%)	331/598 (55.35%)	704/1154 (61.01%)	727/1150 (63.22%)	681/1158 (58.81%)	649/1139 (56.98%)
<i>PCV10 serotype</i>	233/1152 (20.23%)	102/598 (17.06%)	140/1154 (12.13%)	113/1150 (9.83%)	89/1158 (7.69%)	55/1139 (4.83%)
<i>PCV13+ serotype</i>	84/1152 (7.29%)	27/598 (4.52%)	52/1154 (4.51%)	87/1150 (7.57%)	74/1158 (6.39%)	96/1139 (8.43%)
<i>PCV20+ serotype</i>	112/1152 (9.72%)	56/598 (9.36%)	110/1154 (9.53%)	149/1150 (12.96%)	117/1158 (10.10%)	111/1139 (9.75%)
<i>Other</i>	347/1152 (30.12%)	146/598 (24.41%)	402/1154 (34.84%)	378/1150 (32.87%)	401/1158 (34.63%)	387/1139 (33.98%)
Urban age 2-5 y						
<i>Any</i>	102/157 (64.97%)		99/152 (65.13%)	100/151 (66.23%)	95/152 (62.50%)	94/149 (63.09%)
<i>PCV10 serotype</i>	29/157 (18.47%)		31/152 (20.39%)	22/151 (14.57%)	13/152 (8.55%)	15/149 (10.07%)
<i>PCV13+ serotype</i>	9/157 (5.73%)		11/152 (7.24%)	12/151 (7.95%)	14/152 (9.21%)	15/149 (10.07%)
<i>PCV20+ serotype</i>	20/157 (12.74%)		11/152 (7.24%)	20/151 (13.25%)	11/152 (7.24%)	16/149 (10.74%)
<i>Other</i>	44/157 (28.03%)		46/152 (30.26%)	46/151 (30.46%)	57/152 (37.50%)	48/149 (32.21%)

Rural age <2y						
<i>Any</i>		488/600 (81.33%)		748/914 (81.84%)	561/618 (90.78%)	
<i>PCV10 serotype</i>		166/600 (27.67%)		98/914 (10.72%)	51/618 (8.25%)	
<i>PCV13+ serotype</i>		44/600 (7.33%)		69/914 (7.55%)	83/618 (13.43%)	
<i>PCV20+ serotype</i>		67/600 (11.17%)		141/914 (15.43%)	96/618 (15.53%)	
<i>Other</i>		211/600 (35.17%)		440/914 (48.14%)	331/618 (53.56%)	
TYTBI 0-8 weeks						
<i>Any</i>	105/600 (17.50%)	28/184 (15.22%)	31/123 (25.20%)	101/604 (16.72%)		106/599 (17.70%)
<i>PCV10 serotype</i>	26/600 (4.33%)	1/184 (0.54%)	6/123 (4.88%)	11/604 (1.82%)		8/599 (1.34%)
<i>PCV13+ serotype</i>	7/600 (1.17%)		2/123 (1.63%)	9/604 (1.49%)		13/599 (2.17%)
<i>PCV20+ serotype</i>	10/600 (1.67%)	7/184 (3.80%)	6/123 (4.88%)	14/604 (2.32%)		17/599 (2.84%)
<i>Other</i>	62/600 (10.33%)	20/184 (10.87%)	17/123 (13.82%)	67/604 (11.09%)		68/599 (11.35%)

PCV10 serotypes: 1, 4, 5, 6B, 7F, 9V, 14, 18C, 19F, 23F. Additional PCV13+ serotypes: 3, 6A, 19A; Additional PCV20+ serotypes: 8, 10A, 11A, 12F, 15B, 22F, 33F.

TABLE S10 ADJUSTED PREVALENCE RATIOS FOR CARRIAGE IN HEALTHY COMMUNITY CHILDREN AS SHOWN IN FIGURE 4

	Year	Age group	Adj PR	LCL	UCL
Carriage of PCV10 serotypes					
<i>Urban healthy children</i>	2016	< 2 years	0.63	0.52	0.77
	2017	< 2 years	0.50	0.41	0.62
	2018	< 2 years	0.38	0.30	0.48
	2019	< 2 years	0.25	0.19	0.33
	2016	2-< 5 years	1.02	0.65	1.61
	2017	2-< 5 years	0.84	0.49	1.45
	2018	2-< 5 years	0.46	0.21	0.98
	2019	2-< 5 years	0.59	0.29	1.19
<i>Rural healthy children</i>	2017	2-< 5 years	0.37	0.28	0.48
	2018	2-< 5 years	0.27	0.19	0.37
<i>Urban carriage in those to young to be vaccinated</i>	2016	0-8 weeks	1.42	0.60	3.37
	2017	0-8 weeks	0.53	0.26	1.06
	2019	0-8 weeks	0.39	0.18	0.85
Carriage of PCV13+ serotypes					
<i>Urban healthy children</i>	2016	< 2years	0.69	0.50	0.97
	2017	< 2years	1.16	0.88	1.54
	2018	< 2years	0.95	0.71	1.28
	2019	< 2years	1.30	0.99	1.70
	2016	2-< 5 years	1.23	0.52	2.90
	2017	2-< 5 years	1.37	0.56	3.35
	2018	2-< 5 years	1.62	0.63	4.21
	2019	2-< 5 years	1.81	0.73	4.51
<i>Rural healthy children</i>	2017	2-< 5 years	1.13	0.69	1.85
	2018	2-< 5 years	1.85	1.15	2.99
<i>Urban carriage in those to young to be vaccinated</i>	2016	0-8 weeks	1.82	0.38	8.68
	2017	0-8 weeks	1.67	0.63	4.46
	2019	0-8 weeks	2.43	0.98	6.07
Carriage of PCV20+ serotypes					
<i>Urban healthy children</i>	2016	< 2years	0.86	0.72	1.04
	2017	< 2years	1.24	1.05	1.46
	2018	< 2years	0.97	0.81	1.16
	2019	< 2years	1.11	0.94	1.31
	2016	2-< 5 years	0.76	0.45	1.26

	2017	2-< 5 years	1.12	0.69	1.82
	2018	2-< 5 years	0.89	0.50	1.59
	2019	2-< 5 years	1.26	0.75	2.13
<i>Rural healthy children</i>	2017	2-< 5 years	1.31	0.99	1.73
	2018	2-< 5 years	1.55	1.17	2.05
<i>Urban carriage in those to young to be vaccinated</i>	2016	0-8 weeks	2.13	0.98	4.63
	2017	0-8 weeks	1.25	0.71	2.19
	2019	0-8 weeks	1.64	0.97	2.77