

Supplementary Material.

Country-stratified data of *S. pneumoniae*-related burden and year of implementation of PCV vaccination policy

	City	Under-5 mortality (n, 2015 estimate) ^a	Childhood (U5) pneumonia mortality (n, 2015 estimate) ^a	Pneumococcal conjugate vaccine ^b (Year introduced)
Cambodia	Phnom Penh	4 975	1 398	PCV13 (2015)
China	Beijing	88 139	14 862	Pending
Haiti	Port-au-Prince	11 304	3 597	PCV13 (2018)
India	Lucknow/ Pune-Vadu	505 146	143 228	PCV13 (2017)
Madagascar	Antananarivo	23 886	5 854	PCV10 (2012)
Mali	Bamako	55 271	8 891	PCV13 (2011)
Mongolia	Ulaanbaatar	792	196	PCV13 (2016)
Paraguay	San Lorenzo	1 309	247	PCV10 (2012)

^aEstimate from Liu L et al. *Lancet* 2016; 388:3027-35. ^bInternational Vaccine Access Center (IVAC), Johns Hopkins Bloomberg School of Public Health. Vaccine Information Management System (VIMS). VIEW-hub tool. 2020. View-hub.org.

Definition of pneumonia cases and controls

Eligible cases presented the following clinical features:

- (1) cough and/or dyspnea, and
- (2) tachypnea, as delineated by the WHO (breathing rate ≥ 50 cycles per minute in children between 2 and 12 months of age and ≥ 40 cycles per minute in children between 12 and 59 months of age), and
- (3) first symptoms appearing within the last 14 days, and
- (4) radiological confirmation of pneumonia on chest X-ray, as defined per World Health Organization (WHO) guidelines [11].

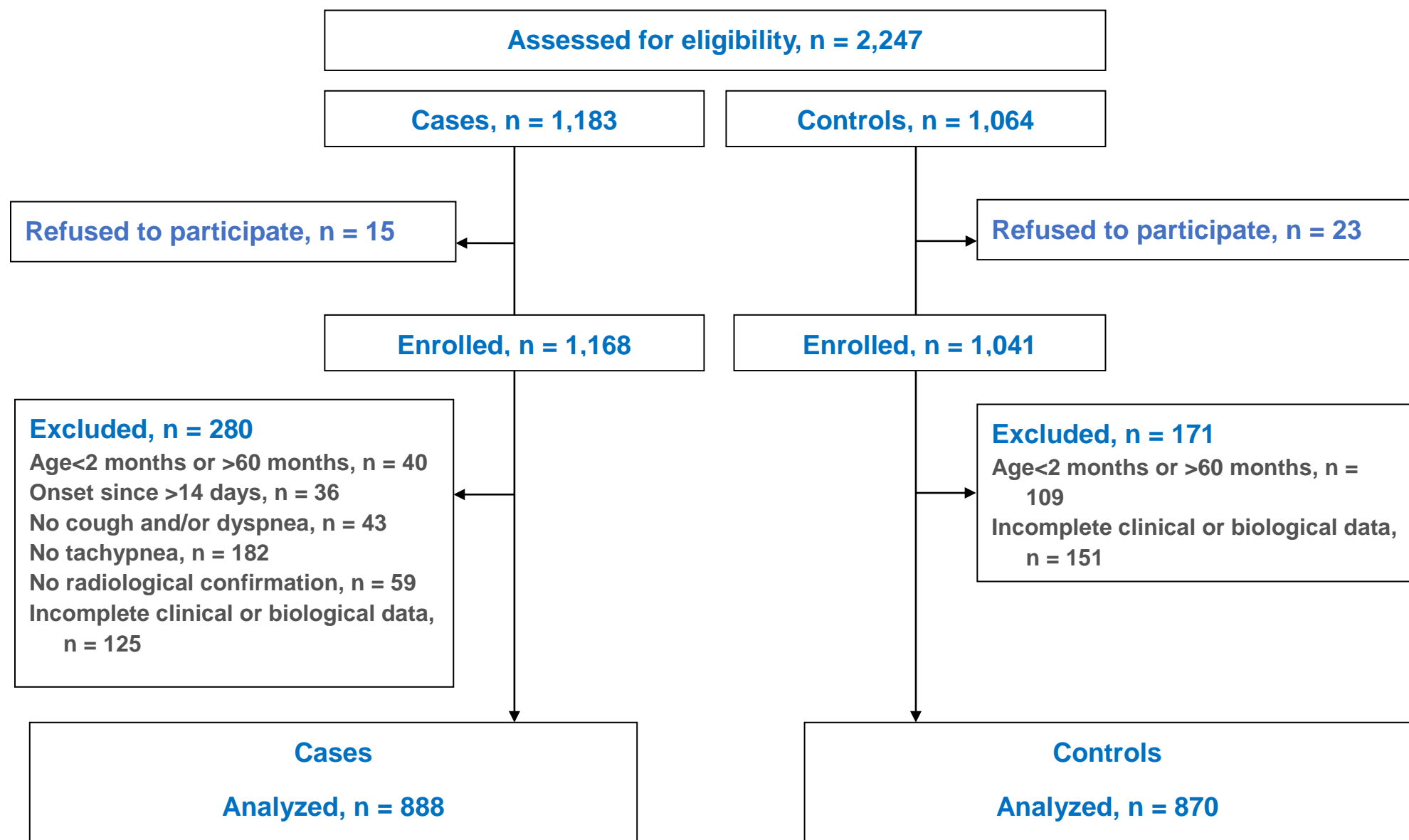
Inclusion criteria for controls were:

- (1) no symptoms of respiratory illness/upper respiratory tract infection, and
- (2) between 2 and 60 months of age, and

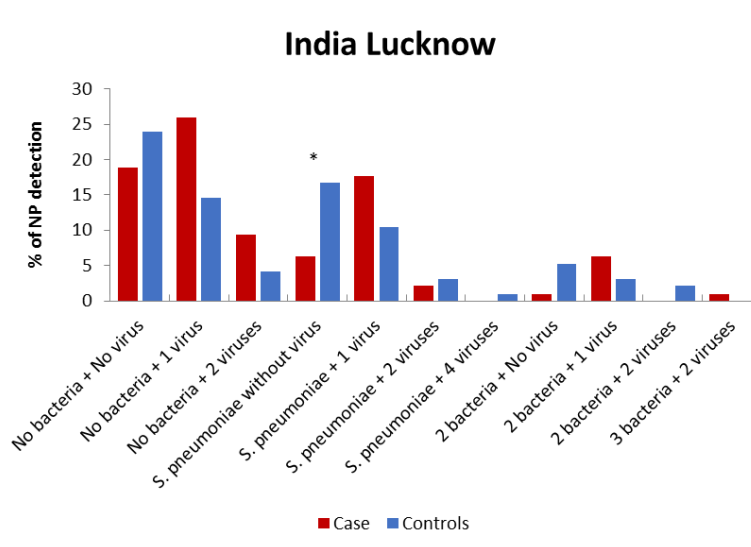
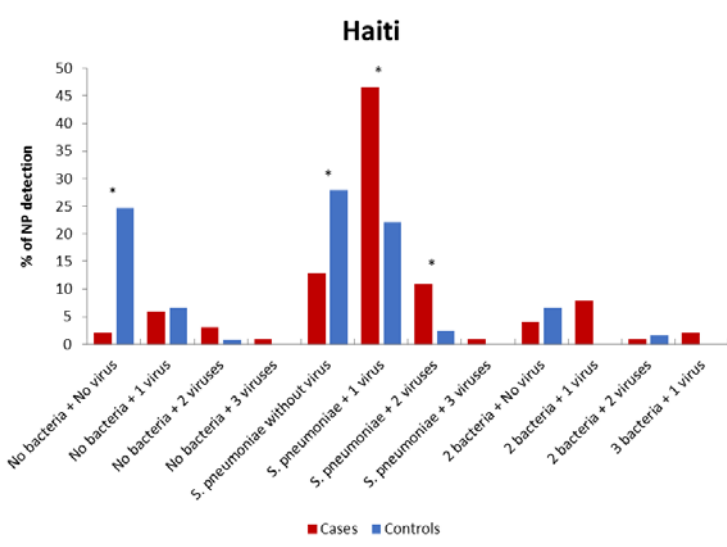
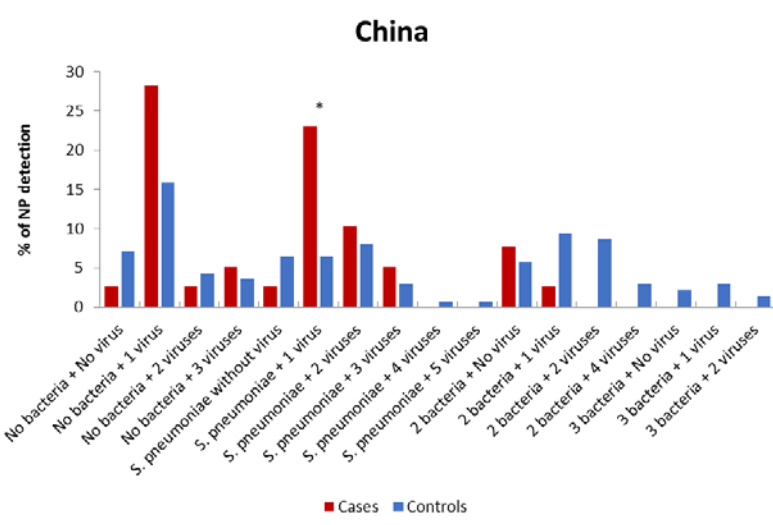
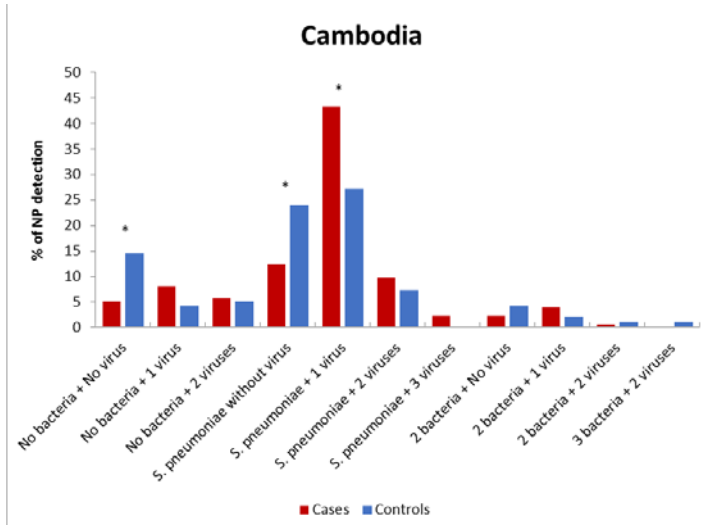
(3) hospitalized for surgery or attending routine outpatient appointment at hospital site.

No specific quota of inclusion per day was used.

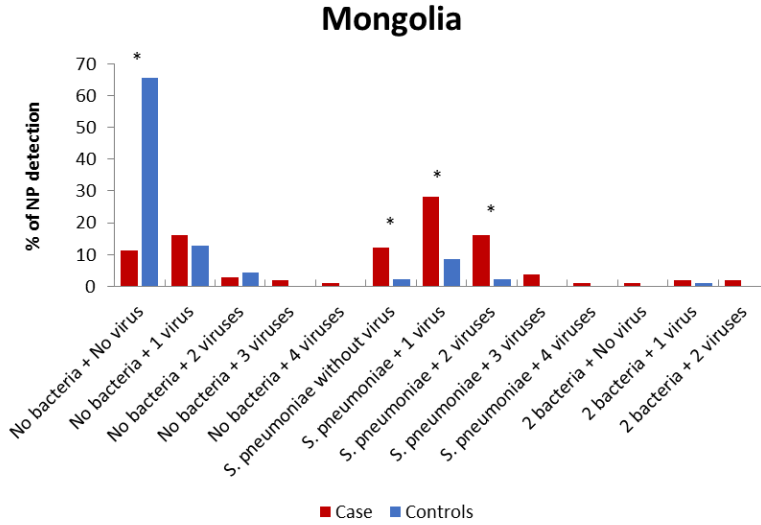
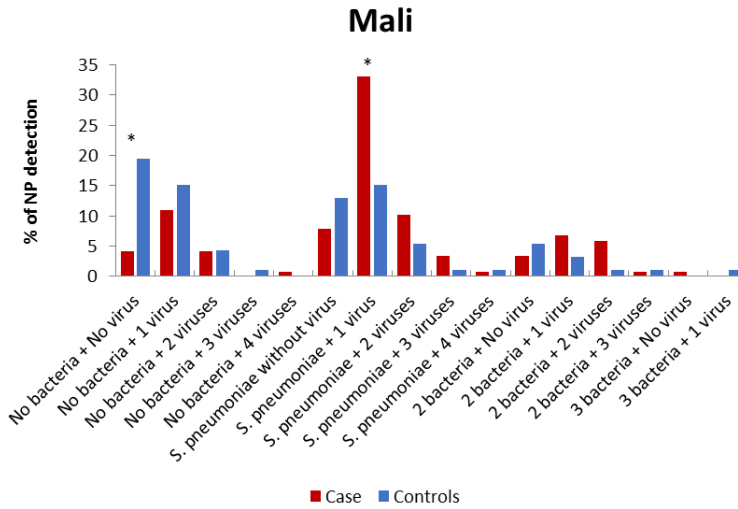
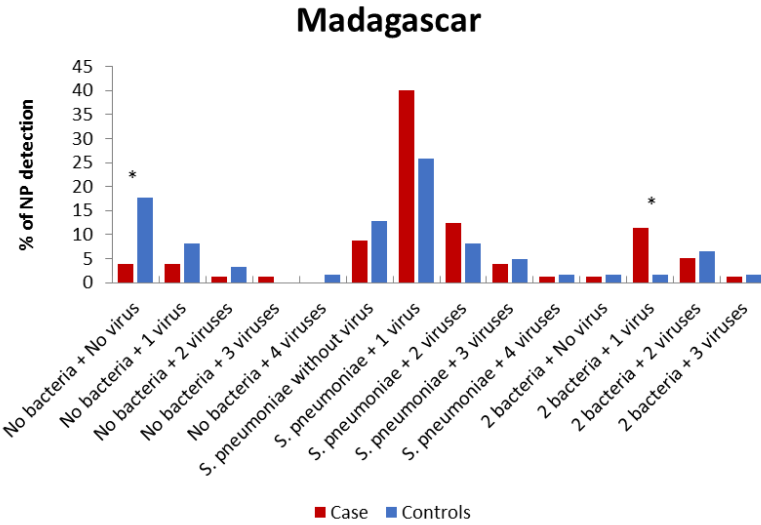
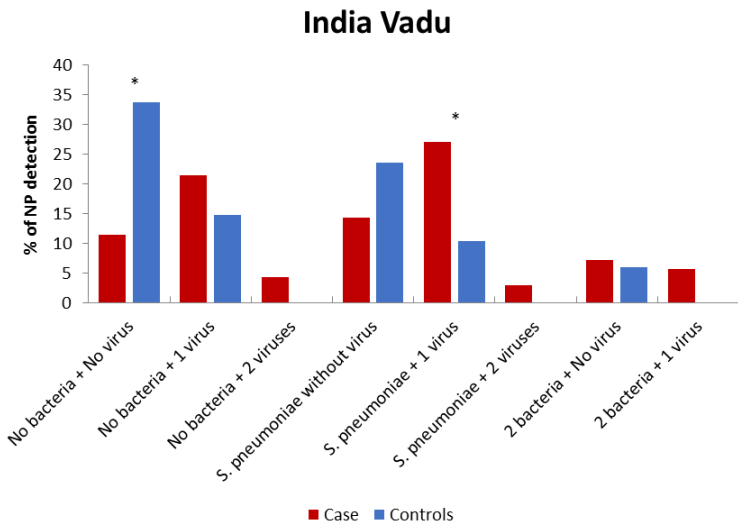
Supplementary Material Figure 1. Flow chart of the study



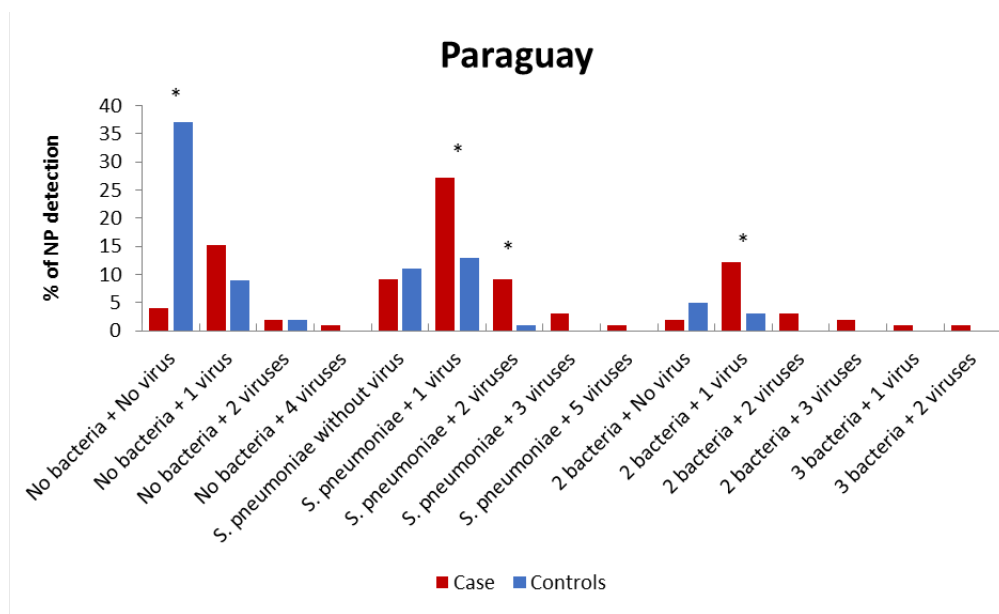
Supplementary Material Figure 2. Site-stratified description of the number of bacteria and virus co-detected, by patient group, the GABRIEL Network pneumonia study, 2010 through 2014



Supplementary Material Figure 2 (continued). Site-stratified description of the number of bacteria and virus co-detected, by patient group, the GABRIEL Network pneumonia study, 2010 through 2014



Supplementary Material Figure 2 (continued). Site-stratified description of the number of bacteria and virus co-detected, by patient group, the GABRIEL Network pneumonia study, 2010 through 2014



NOTE : * :p<0.05

Supplementary Material Table 1. Description of the excluded population, the GABRIEL Network pneumonia study, 2010 through 2014

Characteristics	Overall (n=1,183)		P-value
	Excluded cases (n=295)	Included cases (n=888)	
Demographics on admission†			
Male gender	165/265 (62.3)	525/888 (59.4)	0.40
Study site			<0.001
<i>Cambodia</i>	35/295 (11.9)	176/888 (19.8)	
<i>China</i>	139/295 (47.1)	39/888 (4.4)	
<i>Haiti</i>	38/295 (12.9)	101/888 (11.4)	
<i>India Lucknow</i>	6/295 (2.0)	96/888 (10.8)	
<i>India Vadu</i>	12/295 (4.1)	71/888 (8.0)	
<i>Madagascar</i>	51/295 (17.3)	80/888 (9.0)	
<i>Mali</i>	1/295 (0.3)	118/888 (13.3)	
<i>Mongolia</i>	12/295 (4.1)	108/888 (12.2)	
<i>Paraguay</i>	1/295 (0.3)	99/888 (11.2)	
Quarter of inclusion			0.39
<i>January-March</i>	74/267 (27.7)	202/887 (22.8)	
<i>April-June</i>	54/267 (20.2)	180/887 (20.3)	
<i>July-September</i>	59/267 (22.1)	221/887 (24.9)	
<i>October-December</i>	80/267 (30.0)	284/887 (32.0)	
Age, months, median (IQR)		19.8 (9.0-28.0)	<0.001
Age category			0.002
<i>2 to 11 months</i>	85/260 (32.7)	333/888 (37.5)	
<i>12 to 23 months</i>	57/260 (21.9)	256/888 (28.8)	
<i>24 to 60 months</i>	118/260 (45.4)	299/888 (33.7)	
Weight, kg, median (IQR)	11.0 (7.8-14.5)	9.0 (7.0-11.0)	<0.001
Height, cm, median (IQR)	76 (66-90)	78.0 (68.0-88.0)	0.96
Body mass index, median (IQR)	15.9 (13.8-18.0)	15.1 (13.6-16.9)	0.012
Mid-upper arm circumference, median (IQR)	14.0 (12.5-15.5)	14.0 (12.5-16.0)	0.76
Weight-for-height Z-score ≤2 SD	38/251 (15.1)	200/775 (25.8)	0.001
Weight-for-height Z-score ≤3 SD	14/251 (5.6)	92/775 (11.9)	0.004
Medical history†			
Heart condition	11/264 (4.2)	39/886 (4.4)	0.87
Lung disease	27/205 (13.2)	105/704 (14.9)	0.53
Tuberculosis	1/221 (0.5)	6/873 (0.7)	0.99
Asthma	3/216 (1.4)	17/874 (2.0)	0.78
Pneumonia	43/158 (27.2)	205/624 (32.9)	0.17
HIV-positive	2/242 (0.8)	9/758 (1.9)	0.99
Contracted a cold or pharyngitis during prior 2 weeks	39/217 (18.0)	164/693 (23.7)	0.079
Contracted influenza during prior 2 weeks	14/203 (6.9)	90/671 (13.4)	0.012
Prior treatment of fever‡	192/261 (73.6)	629/877 (71.7)	0.56
Antibiotic usage history‡	158/221 (71.5)	443/701 (63.2)	0.024
PCV vaccination	1/86 (1.2)	21/614 (3.4)	0.50
Vital signs on admission			

Temperature, °C, median (IQR)	38.0 (37.0-38.6)	38.3 (37.7-38.8)	<0.001
Breathing rate, cycles/min, median (IQR)	38 (28-50)	54 (46-60)	<0.001
Cardiac rate, beats/min, median (IQR)	127.5 (114.5-140.5)	136 (120.5-152)	<0.001
Systolic blood pressure, mmHg, median (IQR)	90 (85-100)	90 (84-98)	<0.001
Diastolic blood pressure, mmHg, median (IQR)	60 (52-60)	60 (56-68)	0.039
Arterial oxygen saturation, %, median (IQR)	97 (95-99)	95 (92-97)	<0.001

NOTE: † Reported as number/number with available data (%), ‡ For the current illness, HIV: Human immunodeficiency virus,

IQR: Interquartile range, PCV: Pneumococcal conjugate vaccine, SD: Standard deviation

Supplementary Material Table 1 (continued). Description of the excluded population, the GABRIEL Network pneumonia study, 2010 through 2014

Characteristics	Overall (n=1,064)		P-value
	Excluded controls (n=194)	Included controls (n=870)	
Demographics on admission†			
Male gender	55/99 (55.6)	497/867 (57.3)	0.74
Study site			
<i>Cambodia</i>	15/194 (7.7)	96/870 (11.0)	<0.001
<i>China</i>	0/194 (0.0)	138/870 (15.9)	
<i>Haiti</i>	30/194 (15.5)	122/870 (14.0)	
<i>India Lucknow</i>	8/194 (4.1)	96/870 (11.0)	
<i>India Vadu</i>	18/194 (9.3)	70/870 (8.1)	
<i>Madagascar</i>	72/194 (37.1)	62/870 (7.1)	
<i>Mali</i>	8/194 (4.1)	93/870 (10.7)	
<i>Mongolia</i>	43/194 (22.2)	93/870 (10.7)	
<i>Paraguay</i>	0/194 (0.0)	100/870 (11.5)	
Quarter of inclusion			0.021
<i>January-March</i>	25/114 (21.9)	195/865 (22.5)	
<i>April-June</i>	11/114 (9.7)	180/865 (20.8)	
<i>July-September</i>	31/114 (27.2)	220/865 (25.4)	
<i>October-December</i>	47/114 (41.2)	270/865 (31.2)	
Age, months, median (IQR)	23.0 (10.0-36.0)	17.0 (9.0-33.0)	0.057
Age category			0.39
<i>2 to 11 months</i>	32/87 (36.8)	294/870 (33.8)	
<i>12 to 23 months</i>	18/87 (20.7)	239/870 (27.5)	
<i>24 to 60 months</i>	37/87 (42.5)	336/870 (38.9)	
Weight, kg, median (IQR)	10.0 (8.0-13.0)	10.0 (7.5-13.0)	0.46
Height, cm, median (IQR)	80.0 (70.0-86.3)	76.0 (67.0-89.0)	0.057
Body mass index, median (IQR)	14.7 (13.7-15.6)	15.6 (14.1-17.2)	0.07
Mid-upper arm circumference, median (IQR)	14.6 (13.0-16.4)	14.0 (13.0-16.0)	0.11
Weight-for-height Z-score ≤2 SD	25/98 (25.5)	161/835 (19.3)	0.14
Weight-for-height Z-score ≤3 SD	11/98 (11.2)	77/835 (9.2)	0.47
Medical history†			
Heart condition	0/99 (0.0)	11/767 (1.4)	0.23
Lung disease	0/113 (0.0)	9/862 (1.0)	0.28
Tuberculosis	0/113 (0.0)	10/855 (1.2)	0.25
Asthma	0/112 (0.0)	3/853 (0.4)	0.53
Pneumonia	0/73 (0.0)	2/795 (0.3)	0.67
HIV-positive	3/93 (3.1)	10/819 (1.2)	0.14
Contracted a cold or pharyngitis during prior 2 weeks	7/98 (7.1)	26/756 (3.4)	0.073
Contracted influenza during prior 2 weeks	4/97 (4.1)	6/750 (0.8)	0.004
Prior treatment of fever‡	30/107 (28.0)	83/830 (10.0)	<0.001
Prior antibiotic treatment‡	19/81 (23.5)	201/720 (27.9)	0.39
PCV vaccination	1/107 (0.9)	51/584 (8.7)	0.002

Vital signs on admission

Temperature, °C, median (IQR)	37.1 (36.5-37.5)	36.8 (36.3-37)	0.007
Breathing rate, cycles/min, median (IQR)	31 (28-37)	32 (26-36)	0.64
Cardiac rate, beats/min, median (IQR)	119 (100-130)	110 (100-122)	0.63
Systolic blood pressure, mmHg, median (IQR)	90 (90-100)	90 (90-100)	0.36
Diastolic blood pressure, mmHg, median (IQR)	60 (60-70)	60 (54.5-60)	0.068
Arterial oxygen saturation, %, median (IQR)	98 (96-99)	99 (97-100)	<0.001

NOTE: † Reported as number/number with available data (%), ‡ For the current illness, HIV: Human immunodeficiency virus,

IQR: Interquartile range, PCV: Pneumococcal conjugate vaccine, SD: Standard deviation

Supplementary Material Table 2. Comparison of clinical characteristics between pneumonia cases and controls in the entire population (N=1,758), the GABRIEL Network pneumonia study, 2010 through 2014

Characteristics	Overall (n=1,758)		
	Cases (n=888)	Controls (n=870)	P-value
Demographics on admission[†]			
Male gender	525/888 (59.4)	497/867 (57.3)	0.39
Study site			<0.001
<i>Cambodia</i>	176/888 (19.8)	96/870 (11.0)	
<i>China</i>	39/888 (4.4)	138/870 (15.9)	
<i>Haiti</i>	101/888 (11.4)	122/870 (14.0)	
<i>India Lucknow</i>	96/888 (10.8)	96/870 (11.0)	
<i>India Pune/Vadu</i>	71/888 (8.0)	70/870 (8.1)	
<i>Madagascar</i>	80/888 (9.0)	62/870 (7.1)	
<i>Mali</i>	118/888 (13.3)	93/870 (10.7)	
<i>Mongolia</i>	108/888 (12.2)	93/870 (10.7)	
<i>Paraguay</i>	99/888 (11.2)	100/870 (11.5)	
Quarter of inclusion			0.98
<i>January-March</i>	202/887 (22.8)	195/865 (22.5)	
<i>April-June</i>	180/887 (20.3)	180/865 (20.8)	
<i>July-September</i>	221/887 (24.9)	220/865 (25.4)	
<i>October-December</i>	284/887 (32.0)	270/865 (31.2)	
Age, months, median (IQR)	19.8 (9.0-28.0)	17.0 (9.0-33.0)	0.03
Age category			0.08
<i>2 to 11 months</i>	333/888 (37.5)	294/870 (33.8)	
<i>12 to 23 months</i>	256/888 (28.8)	239/870 (27.5)	
<i>24 to 60 months</i>	299/888 (33.7)	336/870 (38.9)	
Weight, kg, median (IQR)	9.0 (7.0-11.0)	10.0 (7.5-13.0)	<0.001
Height, cm, median (IQR)	78.0 (68.0-88.0)	76.0 (67.0-89.0)	0.73
Body mass index, median (IQR)	15.1 (13.6-16.9)	15.6 (14.1-17.2)	0.006
Mid-upper arm circumference, median (IQR)	14.0 (12.5-16.0)	14.0 (13.0-16.0)	0.18
Weight-for-height Z-score ≤2 SD	200/775 (25.8)	161/835 (19.3)	0.002
Weight-for-height Z-score ≤3 SD	92/775 (11.9)	77/835 (9.2)	0.08
Medical history[†]			
Heart condition	39/886 (4.4)	11/767 (1.4)	<0.001
Lung disease	105/704 (14.9)	9/862 (1.0)	<0.001
Tuberculosis	6/873 (0.7)	10/855 (1.2)	0.3
Asthma	17/874 (2.0)	3/853 (0.4)	0.002
Pneumonia	205/624 (32.9)	2/795 (0.3)	<0.001
Other lung disease	24/694 (3.5)	7/770 (0.9)	0.001
HIV-positive	9/758 (1.9)	10/819 (1.2)	0.95
Contracted a cold or pharyngitis during prior 2 weeks	164/693 (23.7)	26/756 (3.4)	<0.001
Contracted influenza during prior 2 weeks	90/671 (13.4)	6/750 (0.8)	<0.001
Prior treatment of fever [‡]	629/877 (71.7)	83/830 (10.0)	<0.001
Prior antibiotic treatment [‡]	443/701 (63.2)	201/720 (27.9)	<0.001
Urinary detection of antibiotics at admission [‡]	482/684 (70.5)	NA	

PCV vaccination	21/614 (3.4)	51/584 (8.7)	<0.001
Vital signs on admission			
Temperature, °C, median (IQR)	38.3 (37.7-38.8)	36.8 (36.3-37)	<0.001
Breathing rate, cycles/min, median (IQR)	54 (46-60)	32 (26-36)	<0.001
Cardiac rate, beats/min, median (IQR)	136 (120.5-152)	110 (100-122)	<0.001
Systolic blood pressure, mmHg, median (IQR)	90 (84-98)	90 (90-100)	0.003
Diastolic blood pressure, mmHg, median (IQR)	60 (56-68)	60 (54.5-60)	0.03
Arterial oxygen saturation, %, median (IQR)	95 (92-97)	99 (97-100)	<0.001

NOTE: † Reported as number/number with available data (%), ‡ For the current illness, HIV: Human immunodeficiency virus,

IQR: Interquartile range, PCV: Pneumococcal conjugate vaccine, SD: Standard deviation

Supplementary Material Table 3. Description of study population by site and group, n=1,758, the GABRIEL Network pneumonia study, 2010 through 2014

Characteristics	Cambodia		China		Haïti		India Lucknow		India Pune/Vadu		Madagascar		Mali		Mongolia		Paraguay	
	Cases (n=176)	Controls (n=96)	Cases (n=39)	Controls (n=138)	Cases (n=101)	Controls (n=122)	Cases (n=96)	Controls (n=96)	Cases (n=71)	Controls (n=70)	Cases (n=80)	Controls (n=62)	Cases (n=118)	Controls (n=93)	Cases (n=108)	Controls (n=93)	Cases (n=99)	Controls (n=100)
Date of inclusion, median	30/01/11	24/01/11	20/12/11	05/07/11	22/04/13	12/06/13	07/02/13	19/02/13	10/04/13	26/06/13	20/09/11	03/04/12	14/11/12	10/11/11	09/03/12	28/03/12	25/11/11	22/11/11
Minimum	21/10/10	3/11/10	17/02/11	04/08/10	24/04/12	26/04/12	07/08/12	07/08/12	23/06/12	25/06/12	17/01/11	29/12/10	04/07/11	11/07/11	22/09/11	07/10/11	18/05/10	14/09/10
Maximum	02/01/13	21/3/11	15/08/12	14/12/12	06/11/13	24/10/13	06/12/13	13/08/13	05/03/14	03/06/14	15/02/13	13/08/13	20/12/11	27/12/12	25/10/12	30/10/12	20/05/13	27/05/13
Categorical variables, n (%)																		
Gender, male	110/176 (62.5)	41/95 (43.2)	28/39 (71.8)	82/138 (59.4)	58/101 (57.4)	68/122 (55.7)	63/96 (65.6)	57/96 (59.4)	42/71 (59.2)	43/70 (61.4)	43/80 (53.8)	38/60 (63.3)	61/118 (51.7)	57/93 (61.3)	66/108 (61.1)	55/93 (59.1)	56/99 (56.6)	56/100 (56.0)
Age category																		
2 to 11 months	70/176 (39.8)	32/96 (33.3)	17/39 (43.6)	21/138 (15.2)	41/101 (40.6)	44/122 (36.1)	33/96 (34.4)	31/96 (32.3)	27/71 (38.0)	28/70 (40.0)	23/80 (28.8)	27/62 (43.6)	56/118 (47.5)	51/93 (54.8)	27/108 (25.0)	24/93 (25.8)	39/99 (39.4)	37/100 (37.0)
12 to 23 months	63/176 (35.8)	31/96 (32.3)	8/39 (20.5)	26/138 (18.8)	30/101 (29.7)	40/122 (32.8)	15/96 (15.6)	24/96 (13.5)	24/71 (33.8)	22/70 (31.4)	26/80 (32.5)	18/62 (29.0)	22/118 (18.6)	19/93 (20.4)	36/108 (33.3)	33/93 (35.5)	32/99 (32.3)	37/100 (37.0)
24 to 60 months	43/176 (24.4)	33/96 (34.4)	14/39 (35.9)	91/138 (65.9)	30/101 (29.7)	38/122 (31.2)	48/96 (50.0)	52/96 (54.2)	20/71 (28.2)	20/70 (28.6)	31/80 (38.8)	17/62 (27.4)	40/118 (33.9)	23/93 (24.7)	45/108 (41.7)	36/93 (38.7)	28/99 (28.3)	26/100 (26.0)
Quarter																		
January through March	45/176 (25.6)	69/96 (71.9)	18/39 (46.2)	19/138 (13.8)	9/100 (9.0)	19/119 (16.0)	23/96 (24.0)	19/96 (19.8)	11/71 (15.5)	10/70 (14.3)	28/80 (35.0)	16/61 (26.2)	28/118 (23.7)	9/93 (9.7)	30/108 (27.8)	24/93 (25.8)	10/99 (10.1)	10/99 (10.1)
April through June	25/176 (14.2)	0/96 (0.0)	10/39 (25.6)	29/138 (21.0)	42/100 (42.0)	37/119 (31.1)	22/96 (22.9)	25/96 (26.0)	6/71 (8.4)	8/70 (11.4)	11/80 (13.8)	21/61 (34.4)	12/118 (10.2)	9/93 (9.7)	21/108 (19.4)	20/93 (21.5)	31/99 (31.3)	31/99 (31.3)
July through September	4/176 (2.3)	0/96 (0.0)	4/39 (10.3)	46/138 (33.3)	20/100 (20.0)	29/119 (24.4)	24/96 (25.0)	26/96 (27.1)	34/71 (47.9)	36/70 (51.4)	25/80 (31.3)	16/61 (26.2)	55/118 (46.6)	20/93 (21.5)	21/108 (19.4)	19/93 (20.4)	34/99 (34.3)	28/99 (28.3)
October through December	102/176 (58.0)	27/96 (28.1)	7/39 (18.0)	44/138 (31.9)	29/100 (29.0)	34/119 (28.6)	27/96 (28.1)	26/96 (27.1)	20/71 (28.2)	16/70 (22.9)	16/80 (20.0)	8/61 (13.1)	23/118 (19.5)	55/93 (59.1)	36/108 (33.3)	30/93 (32.3)	24/99 (24.2)	30/99 (30.3)

NOTE: DPT-HBV-Hib, Diphtheria, Tetanus, Pertussis, Hepatitis B, Polio and *Hemophilus influenzae* type b; SD, standard deviation

Supplementary Material Table 3 continued. Description of study population by country and group, n = 1,758, the GABRIEL Network pneumonia study, 2010 through 2014

Characteristics	Cambodia		China		Haïti		India Lucknow		India Pune/Vadu		Madagascar		Mali		Mongolia		Paraguay	
	Cases (n=176)	Controls (n=96)	Cases (n=39)	Controls (n=138)	Cases (n=101)	Controls (n=122)	Cases (n=96)	Controls (n=96)	Cases (n=71)	Controls (n=70)	Cases (n=80)	Controls (n=62)	Cases (n=118)	Controls (n=93)	Cases (n=108)	Controls (n=93)	Cases (n=99)	Controls (n=100)
Categorical variables, n (%)																		
HIV-positive	0/178 (0.0)	0/96 (0.0)	0/39 (0.0)	0/138 (0.0)	6/100 (6.0)	8/119 (6.7)	0/96 (0.0)	0/96 (0.0)	0/71 (0.0)	0/70 (0.0)	0/50 (0.0)	1/35 (2.9)	3/118 (2.5)	0/93 (0.0)	0/108 (0.0)	0/93 (0.0)	No data	1/79 (1.3)
Heart disease	4/176 (2.3)	No data	3/39 (7.7)	0/138 (0.0)	1/100 (1.0)	0/121 (0.0)	9/96 (9.4)	0/96 (0.0)	5/71 (7.0)	0/70 (0.0)	2/79 (2.5)	2/61 (3.3)	4/118 (3.4)	0/93 (0.0)	3/108 (2.8)	0/93 (0.0)	8/99 (8.1)	9/95 (9.5)
Weight-for-height Z-score ≤ 2 SD	34/159 (21.4)	10/92 (10.9)	3/39 (7.7)	6/137 (4.4)	35/101 (34.6)	22/121 (18.2)	No data	39/96 (40.6)	30/71 (42.2)	12/70 (17.1)	37/80 (46.2)	24/59 (40.7)	41/118 (34.7)	41/93 (44.1)	3/105 (2.8)	2/93 (2.2)	17/99 (17.2)	5/74 (6.8)
Pneumococcal conjugate vaccine	No data	No data	No data	No data	1/101 (1.0)	0/122 (0.0)	0/96 (0.0)	27/96 (28.1)	1/47 (2.1)	0/49 (0.0)	3/73 (4.1)	2/52 (3.9)	0/118 (0.0)	0/93 (0.0)	0/108 (0.0)	0/93 (0.0)	16/71 (22.5)	22/79 (27.9)
DPT-HBV-Hib vaccine, at least one dose	No data	No data	No data	No data	66/69 (95.7)	99/101 (98.0)	2/96 (2.1)	48/96 (50.0)	59/71 (83.1)	61/70 (87.1)	69/72 (95.8)	53/53 (100.0)	102/118 (86.4)	81/93 (87.1)	107/108 (99.1)	92/93 (98.9)	65/66 (98.5)	82/86 (95.4)
DPT-HBV-Hib vaccine, three doses	No data	No data	No data	No data	44/64 (68.8)	80/101 (79.2)	2/96 (2.1)	23/96 (24.0)	47/71 (66.2)	52/70 (74.3)	64/71 (90.1)	48/53 (90.6)	81/118 (68.6)	69/93 (74.2)	103/108 (95.4)	92/93 (98.9)	51/52 (98.1)	60/83 (72.3)
Influenza vaccine in 2009	No data	No data	No data	No data	0/3 (0.0)	0/122 (0.0)	0/96 (0.0)	0/96 (0.0)	0/71 (0.0)	0/70 (0.0)	0/73 (0.0)	1/48 (2.1)	1/118 (0.8)	0/93 (0.0)	0/108 (0.0)	0/93 (0.0)	19/63 (30.2)	29/71 (40.9)
Prior antibiotic treatment for the current illness	No data	71/93 (76.3)	37/38 (97.4)	105/138 (76.1)	12/100 (12.0)	0/113 (0.0)	93/96 (96.9)	No data	71/71 (100.0)	2/29 (6.9)	40/73 (54.8)	15/60 (25.0)	101/116 (87.1)	5/93 (5.4)	74/108 (68.5)	0/93 (0.0)	15/99 (15.2)	3/100 (3.0)
Urinary detection of antibiotics (cases only)	89/160 (55.6)	-	28/39 (71.8)	-	18/79 (22.8)	-	96/96 (100.0)	-	70/70 (100.0)	-	43/70 (61.4)	-	41/63 (65.1)	-	97/107 (90.7)	-	No data	-
Continuous variables, mean (± SD)																		
Age, months	16.9 (11.3)	22.4 (17.8)	19.6 (17.0)	29.8 (16.6)	18.9 (13.6)	20.0 (13.7)	26.1 (19.7)	27.4 (19.9)	17.6 (12.2)	19.2 (13.9)	22.2 (14.6)	17.1 (12.6)	17.7 (14.7)	14.8 (12.7)	23.5 (14.6)	22.9 (14.5)	17.8 (13.1)	16.9 (13.2)
Weight-for-height Z-score	-1.1 (1.4)	-0.6 (1.6)	0.1 (2.0)	0.2 (1.5)	-1.6 (1.6)	-0.7 (1.6)	No data	-2.0 (1.4)	-1.8 (1.5)	-0.8 (1.3)	-2.0 (1.4)	-1.8 (1.5)	-1.7 (1.7)	-2.0 (1.7)	0.2 (1.0)	-1.0 (4.9)	-0.3 (1.8)	0.0 (1.3)

Abbreviations: DPT-HBV-Hib, Diphtheria, Tetanus, Pertussis, Hepatitis B, Polio, and *Haemophilus influenzae* type b; SD, standard deviation

Supplementary Material Table 4. Microorganisms detection in nasopharyngeal samples of pneumonia cases and controls, the GABRIEL Network pneumonia study, 2010 through 2014

	Cases, nasopharyngeal swabs, n=888	Controls, nasopharyngeal swabs, n=870	p-value
Number of patients with bacteria detection, n (%)			
<i>Streptococcus pneumoniae</i>	605 (68.1)	412 (47.4)	<0.001
<i>Staphylococcus aureus</i>	107 (12.1)	148 (17.0)	0.003
<i>Haemophilus influenzae</i>	47 (5.3)	57 (6.6)	0.26
<i>Mycoplasma pneumoniae</i>	13 (1.5)	6 (0.7)	0.12
<i>Chlamydomphila pneumoniae</i>	4 (0.5)	2 (0.2)	0.69
Number of patients with viral detection, n (%)			
Rhinovirus	221 (24.9)	188 (21.6)	0.10
Respiratory Syncytial Virus A/B	178 (20.1)	34 (3.9)	<0.001
Bocavirus	82 (9.2)	104 (12.0)	0.064
Parainfluenza virus 1/2/3/4	104 (11.7)	44 (5.1)	<0.001
Coronavirus NL63/229E/OC43/HKU1	59 (6.6)	74 (8.5)	0.14
Adenovirus	68 (7.7)	65 (7.5)	0.88
Influenza virus A/A(H1N1)/B	86 (9.7)	15 (1.7)	<0.001
Human Metapneumovirus A/B	76 (8.6)	10 (1.2)	<0.001
Enterovirus	42 (4.7)	38 (4.4)	0.72
Parechovirus	21 (2.4)	13 (1.5)	0.19

Supplementary Material Table 5. Description of viruses detected in nasopharyngeal samples of pneumonia cases and controls when a virus-bacteria co-detection was found, the GABRIEL Network pneumonia study, 2010 through 2014

	Total n=816	Cases n=527	Controls n=289	p-value
Number of virus detected when a virus/bacteria co-detection was found, n (%)				
1 virus + bacteria	578 (70.8)	380 (72.1)	198 (68.5)	0.28
2 virus + bacteria	187 (22.9)	115 (21.8)	72 (24.9)	0.31
3 virus + bacteria	37 (4.5)	27 (5.1)	10 (3.5)	0.27
4 virus + bacteria	12 (1.2)	4 (0.8)	8 (2.8)	0.03
5 virus + bacteria	2 (0.2)	1 (0.2)	1 (0.3)	0.99
Genus of virus detected when a virus/bacteria co-detection was found, n (%)				
	Total with virus/bacteria co-detection n=816	Cases with co-detection n=527	Controls with virus/bacteria co-detection n=289	p-value
Rhinovirus	259 (31.7)	150 (28.5)	109 (37.7)	0.007
Respiratory Syncytial Virus A/B	136 (16.7)	121 (23.0)	15 (5.2)	<.001
Bocavirus	129 (15.8)	60 (11.4)	69 (23.9)	<.001
Parainfluenza virus 1/2/3/4	93 (11.4)	66 (12.5)	27 (9.3)	0.171
Coronavirus NL63/229E/OC43/HKU1	86 (10.5)	47 (8.9)	39 (13.5)	0.042

Adenovirus	100 (12.3)	54 (10.3)	46 (15.9)	0.018
Influenza virus A/A(H1N1)/B	64 (7.8)	58 (11.0)	6 (2.1)	<.001
Human Metapneumovirus A/B	54 (6.6)	48 (9.1)	6 (2.1)	<0.001
Enterovirus	56 (6.9)	35 (6.6)	21 (7.3)	0.736
Parechovirus	23 (2.8)	17 (3.2)	6 (2.1)	0.343

Supplementary Material Table 6. Site-stratified adjusted odds ratio of pneumonia according to the microorganisms detected in nasopharyngeal samples, the GABRIEL Network, 2010 through 2014

Cambodia

	aOR of the risk of pneumonia for the detection of the virus without <i>S.pneumoniae</i> (95% CI)	p-value	aOR of the risk of pneumonia for the co-detection virus + <i>S.pneumoniae</i> (95% CI)	p-value
Rhinovirus	3.35 (1.45-7.76)	0.061	4.94 (1.54-15.85)	0.007
Respiratory Syncytial Virus	19.95 (4.82-82.60)	0.061	23.48 (4.99-110.34)	<0.001
Parainfluenza virus	3.95 (0.94-16.60)	0.061	7.57 (1.40-40.93)	0.019
Influenza virus	3.38 (0.47-24.22)	0.226	4.51 (0.50-40.91)	0.181
Human Metapneumovirus	4.47 (1.15-17.40)	0.031	6.50 (1.27-33.14)	0.024

China

	aOR of the risk of pneumonia for the detection of the virus without <i>S.pneumoniae</i> (95% CI)	p-value	aOR of the risk of pneumonia for the co-detection virus + <i>S.pneumoniae</i> (95% CI)	p-value
Rhinovirus	0.60 (0.25-1.45)	0.259	1.06 (0.30-3.78)	0.929
Respiratory Syncytial Virus	7.45 (2.58-21.53)	<0.001	7.93 (1.37-46.04)	0.021
Parainfluenza virus	0.53 (0.16-1.79)	0.313	2.03 (0.40-10.35)	0.394
Influenza virus	2.17 (0.43-10.91)	0.349	5.81 (0.42-81.32)	0.191
Human Metapneumovirus	NA	NA	NA	NA

Supplementary Material Table 6. Site-stratified adjusted odds ratio of pneumonia according to the microorganisms detected in nasopharyngeal samples, the GABRIEL Network, 2010 through 2014

Haiti

	aOR of the risk of pneumonia for the detection of the virus without <i>S.pneumoniae</i> (95% CI)	p-value	aOR of the risk of pneumonia for the co-detection virus + <i>S.pneumoniae</i> (95% CI)	p-value
Rhinovirus	1.28 (0.56-2.94)	0.564	4.77 (1.54-14.81)	0.007
Respiratory Syncytial Virus	83.54 (10.59-658-78)	<0.001	235.90 (26.25-2120.02)	<0.001
Parainfluenza virus	7.29 (2.17-24.44)	0.001	46.31 (8.09-265.13)	<0.001
Influenza virus	NA	NA	NA	NA
Human Metapneumovirus	1.94 (0.13-29.17)	0.633	2.94 (0.12-69.87)	0.505

India Lucknow

	aOR of the risk of pneumonia for the detection of the virus without <i>S.pneumoniae</i> (95% CI)	p-value	aOR of the risk of pneumonia for the co-detection virus + <i>S.pneumoniae</i> (95% CI)	p-value
Rhinovirus	1.41 (0.74-2.69)	0.299	1.07 (0.42-2.74)	0.880
Respiratory Syncytial Virus	3.22 (0.75-13.82)	0.116	1.39 (0.16-11.73)	0.740
Parainfluenza virus	10.24 (2.14-48.89)	0.004	NA	NA
Influenza virus	9.98 (2.04-48.75)	0.004	NA	NA
Human Metapneumovirus	0.85 (0.10-6.95)	0.881	NA	NA

Supplementary Material Table 6 (continued). Site-stratified adjusted odds ratio of pneumonia according to the microorganisms detected in nasopharyngeal samples, the GABRIEL Network, 2010 through 2014

India Pune/Vadu

	aOR of the risk of pneumonia for the detection of the virus without <i>S.pneumoniae</i> (95% CI)	p-value	aOR of the risk of pneumonia for the co-detection virus + <i>S.pneumoniae</i> (95% CI)	p-value
Rhinovirus	2.20 (0.91-5.31)	0.08	9.88 (2.14-45.66)	0.003
Respiratory Syncytial Virus	7.14 (1.71-29.83)	0.007	15.65 (2.23-109.71)	0.006
Parainfluenza virus	10.64 (1.23-92.16)	0.032	11.91 (1.20-118.08)	0.034
Influenza virus	NA	NA	NA	NA
Human Metapneumovirus	NA	NA	NA	NA

Madagascar

	aOR of the risk of pneumonia for the detection of the virus without <i>S.pneumoniae</i> (95% CI)	p-value	aOR of the risk of pneumonia for the co-detection virus + <i>S.pneumoniae</i> (95% CI)	p-value
Rhinovirus	0.64 (0.28-1.50)	0.31	1.75 (0.54-5.72)	0.353
Respiratory Syncytial Virus	7.58 (1.20-47.86)	0.031	NA	NA
Parainfluenza virus	4.01 (0.89-18.02)	0.070	11.35 (1.73-74.59)	0.011
Influenza virus	2.38 (0.33-17.24)	0.392	11.69 (0.71-191.85)	0.085
Human Metapneumovirus	4.97 (0.51-47.91)	0.166	10.57 (0.94-118.76)	0.056

Supplementary Material Table 6 (continued). Site-stratified adjusted odds ratio of pneumonia according to the microorganisms detected in nasopharyngeal samples, the GABRIEL Network, 2010 through 2014

Mali

	aOR of the risk of pneumonia for the detection of the virus without <i>S.pneumoniae</i> (95% CI)	p-value	aOR of the risk of pneumonia for the co-detection virus + <i>S.pneumoniae</i> (95% CI)	p-value
Rhinovirus	1.04 (0.53-2.07)	0.904	2.66 (1.06-6.68)	0.038
Respiratory Syncytial Virus	8.93 (3.24-24.64)	<0.001	33.31 (6.67-166.45)	<0.001
Parainfluenza virus	1.82 (0.62-5.35)	0.278	3.76 (1.00-14.25)	0.050
Influenza virus	19.54 (2.25-170.10)	0.007	NA	NA
Human Metapneumovirus	12.70 (1.53-105.50)	0.019	NA	NA

Mongolia

	aOR of the risk of pneumonia for the detection of the virus without <i>S.pneumoniae</i> (95% CI)	p-value	aOR of the risk of pneumonia for the co-detection virus + <i>S.pneumoniae</i> (95% CI)	p-value
Rhinovirus	2.33 (0.82-6.66)	0.114	29.62 (6.17-142.08)	<0.001
Respiratory Syncytial Virus	2.54 (0.84-7.68)	0.098	35.81 (6.40-200.44)	<0.001
Parainfluenza virus	19.72 (2.22-175.28)	0.007	NA	NA
Influenza virus	NA	NA	NA	NA
Human Metapneumovirus	NA	NA	NA	NA

Supplementary Material Table 6 (continued). Site-stratified adjusted odds ratio of pneumonia according to the microorganisms detected in nasopharyngeal samples, the GABRIEL Network, 2010 through 2014

Paraguay

	aOR of the risk of pneumonia for the detection of the virus without <i>S.pneumoniae</i> (95% CI)	p-value	aOR of the risk of pneumonia for the co-detection virus + <i>S.pneumoniae</i> (95% CI)	p-value
Rhinovirus	3.62 (1.65-7.93)	0.001	19.01 (6.33-57.05)	<0.001
Respiratory Syncytial Virus	NA	NA	NA	NA
Parainfluenza virus	NA	NA	NA	NA
Influenza virus	1.90 (0.32-11.10)	0.478	8.66 (0.85-88.55)	0.069
Human Metapneumovirus	31.93 (3.18-320.80)	0.003	38.62 (2.89-515.99)	0.006

NOTE : 95% CI : 95% Confidence Interval, aOR : Adjusted Odds Ratio, NA : Non Applicable

Supplementary Material Table 7. Microorganisms detected in nasopharyngeal samples of patients with hypoxemic pneumonia, by study site, the GABRIEL Network, 2010 through 2014

Number of bacteria detected	Number of virus detected	Bacteria and virus detected	China, n	Haiti, n	India Lucknow, n	India Vadu, n	Madagascar, n	Mali, n	Mongolia, n	Paraguay, n
0	0	-			1	2		2	1	1
0	1	RV				2				
		RSV		1		1	1	1		
		IV		1		1		1		
		HMPV				1		1		1
0	2	RV + CoV		1						
		RV + HMPV			1					
		RV + RSV						1		
		RSV + PIV		1						
		RSV + IV						1		
0	3	RV + HMPV + BoV	1							
0	4	HMPV + AdV + EV + CoV						1		
1	0	SP		1		2		2	1	2
		STA					1			1
1	1	SP + RV		1		3	1	4	1	
		SP + RSV				4	1	5		
		SP + IV		1					1	
		SP + HMPV				1				
		SP + PIV		1		1		1		

		SP + CoV	1		1
		SP + EV		2	
		STA + RV			1
1	2	SP + RV + PIV	1		
		SP + HMPV + BoV		1	
		SP + HMPV + CoV			1

Supplementary Material Table 7 (continued). Microorganisms detected in nasopharyngeal samples of patients with hypoxemic pneumonia, by study site, the GABRIEL Network, 2010 through 2014

Number of bacteria detected	Number of virus detected	Bacteria and virus detected	China, n	Haiti, n	India Lucknow, n	India Vadu, n	Madagascar, n	Mali, n	Mongolia, n	Paraguay, n
		SP + IV + CoV						1		
		SP + PIV + AdV						1		
		STA + RV + RSV						1		
		STA + HMPV + HPeV								1
1	3	SP + HMPV + EV + BoV						1		
2	0	SP + STA						2		
		SP + HIB		1						
		SP + CHLA		1						
2	1	SP + STA + PIV						1		
		SP + STA + RSV								1
2	2	SP + STA + RV + RSV						1		
		SP + HIB + RV + RSV						1		
		SP + HIB + RV + AdV						1		
		STA + HIB + PIV + BoV						1		
2	3	SP + STA + PIV + EV + BoV						1		
		SP + HIB + RV + PIV + AdV								1
3	0	SP + STA + HIB						1		
TOTAL			1	10	2	20	7	36	4	8

NOTE : SP: *Streptococcus pneumoniae*, STA: *Staphylococcus aureus*, HIB: *Haemophilus influenzae* type b, CHLA: *Chlamydophila pneumoniae*, RV : Rhinovirus, RSV : Respiratory Syncytial Virus A/B, BoV : Bocavirus, PIV : Parainfluenza virus 1/2/3/4, CoV : Coronavirus NL63/229E/OC43/HKU1, AdV : Adenovirus, IFV : Influenza virus A/A(H1N1)/B, hMPV: Human Metapneumovirus A/B, EV: Enterovirus, HPeV: Human Parechovirus.