

# A LITERATURE REVIEW AND SURVEY OF CHILDHOOD PNEUMONIA ETIOLOGY STUDIES: 2000 - 2010

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## INTRODUCTION

- Approximately 1.6 million children die from pneumonia annually [1].
- The Pneumonia Etiology Research for Child Health (PERCH) study is the largest multi-site study of childhood pneumonia since the Board of Science and Technology for International Development (BOSTID) studies were done in the 1980's [2].
- PERCH undertaken to identify the expected etiologies of pneumonia in 2015.
- In recent years many developed and developing country sites have initiated pneumonia studies that provide etiology data.
- These studies will provide useful complementary data to the PERCH study.

## METHODS

- PubMed literature review to identify pneumonia etiology studies in children under five.
- Search terms included key words, MeSH terms, synonyms or truncations; 8 separate search strategies were conducted.
- Titles and abstracts were screened and pertinent information was obtained from eligible studies. Studies were grouped by category and summary statistics were calculated.
- A web-based survey conducted to capture information on unpublished ongoing or recently completed studies (Survey Monkey™, Palo Alto, California).
- Emailed to ~5000 pneumonia community members subscribing to PneumoFOCUS [3], a bulletin providing news about pneumonia, pneumococcal disease, and pneumococcus.
- We also contacted: researchers responding to the PERCH Request for Proposals for Sites, other known pneumonia surveillance researchers and researchers identified through our contacts.
- Inclusion criteria: study of acute community-acquired pneumonia or acute lower respiratory tract infection; consistent testing for at least one specific etiology in enrolled patients; enrollment of children <5 years old; published between June 2005 and June 2010; data collection from year 2000 onwards; ≥10 pneumonia/ALRI cases; ≥ 1 calendar year of surveillance; English language.
- Exclusion criteria: exclusive enrollment of bronchiolitis patients or patients with a specific complication or sequelae of pneumonia; inability to distinguish etiology of pneumonia cases from other syndromes; etiology inferred from upper airway carriage alone; focus only on antibiotic resistance among pneumococcal isolates; exclusive enrollment of hospital-acquired pneumonia patients

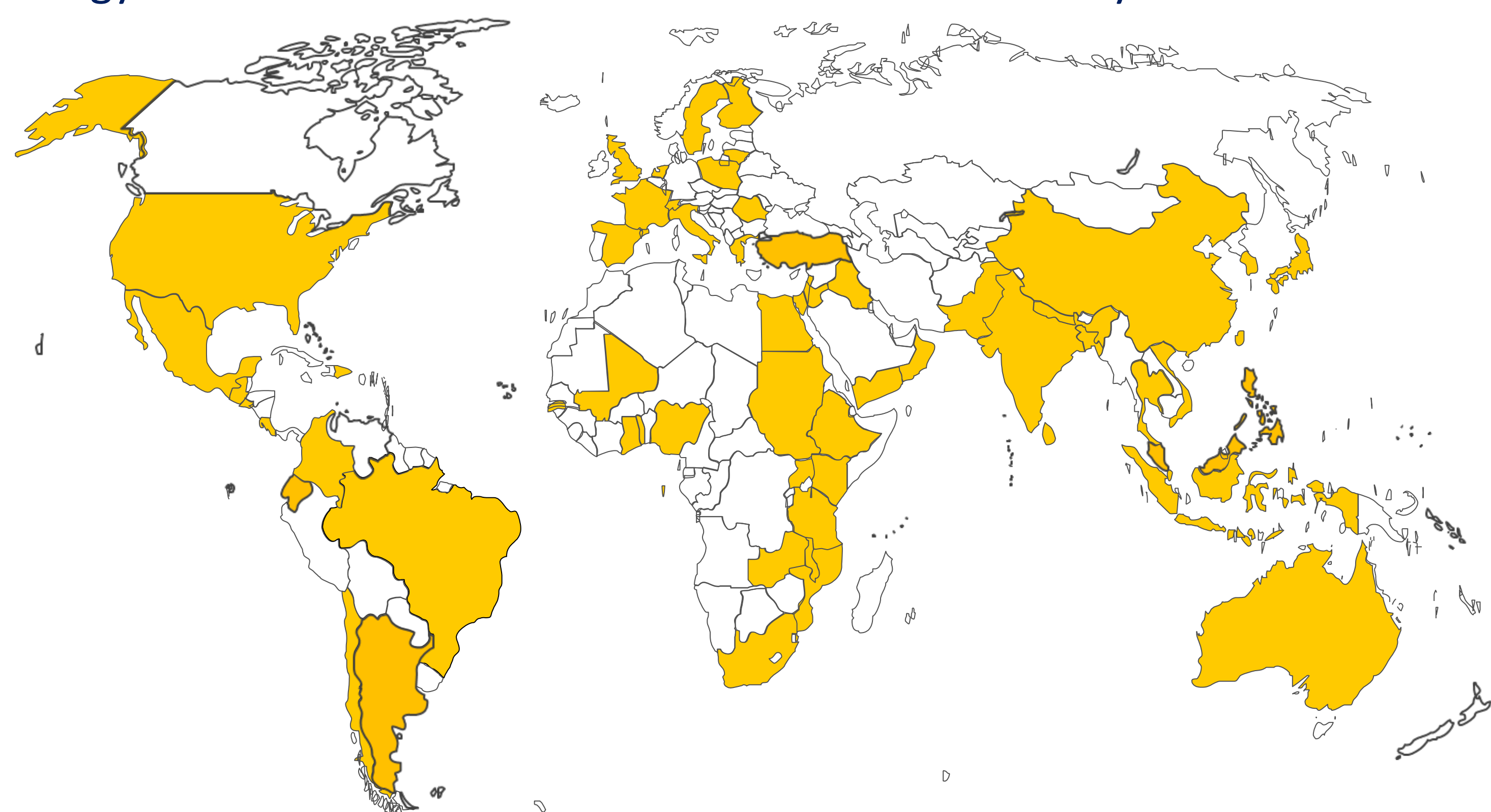
## RESULTS

- We identified 88 published studies in 52 countries ranging from 10 to 21,239 pneumonia patients (median 260 patients) (Figure 1). Multiple studies were done in 26 countries.
- Our survey identified 65 ongoing or recently completed studies in 41 countries ranging from 12 to 27,778 pneumonia patients (median 780 patients). Multiple studies were being conducted in 16 countries.
- Literature review and survey results are not mutually exclusive.
- Study characteristics reported in Table 1 illustrate large variations in the methods used.

## CONCLUSIONS

- Greater depth of available data than conventional wisdom might have suggested.
- Challenges in interpreting various pneumonia etiology studies, particularly when comparing or combining results.
- Different studies employ different case definitions, levels of clinician involvement, facility types, specimens collected and laboratory tests.
- Use of a common protocol in a multi-site study with broad geographic and epidemiologic representation will offer some anchor on which to draw inferences about the similarities and differences from other studies.

**FIGURE 1:** Map of Countries with Recent or Ongoing Child Pneumonia Etiology Studies Identified in Literature Review and Survey



**REFERENCES** 1.Black RE, Cousens S, Johnson HL, et al. Global, regional, and national causes of child mortality in 2008: a systematic analysis. *Lancet* 2010 Jun 5;375(9730):1969-87. 2.Selwyn BJ. The epidemiology of acute respiratory tract infection in young children: comparison of findings from several developing countries. Coordinated Data Group of BOSTID Researchers. *Rev Infect Dis* 1990 Nov-Dec;12 Suppl 8:S870-88. 3.PneumoACTION. PneumoFOCUS. 2011 [cited; Available from: <http://www.preventpneumo.org/news/pneumofocus/index.cfm>

**TABLE 1**

Study Characteristic	Literature Review (N=88)		Survey (N=65)	
	Number of Studies	% of studies <sup>a</sup>	Number of Studies	% of studies <sup>a</sup>
<b>WHO Region</b>				
AFRO	12	14	17	26
EMRO	3	3	5	8
EURO	13	15	5	8
PAHO	18	20	12	18
SEARO	20	23	19	29
WPRO	18	20	6	9
Multi-Region	4	5	1	2
<b>Case Definition<sup>b</sup></b>				
WHO very severe pneumonia	5	6	3	5
WHO severe pneumonia	13	15	36	55
WHO pneumonia	10	11	26	40
Other Clinical +/- laboratory definition	25	28	22	34
Clinical + Radiologic definition	47	52	30	46
Other	41	47	11	17
Unknown	2	--	0	--
<b>Wheeze Included in Case Definition</b>				
Included	9	43	22	38
Excluded	5	24	26	45
Excluded if clears with bronchodilator	2	10	9	16
Other	5	24	1	2
Unknown	67	--	7	--
<b>Facility Type<sup>b</sup></b>				
District/Provincial hospital	9	13	29	45
Subdistrict/Mission hospital	0	0	3	5
Health center/clinic	2	3	13	20
University hospital	29	41	7	11
Other	35	50	24	37
Unknown	18	--	0	--
<b>Type of Patient</b>				
Inpatients only	40	56	30	47
Inpatients and outpatients	29	40	26	41
Outpatients only	0	0	4	6
Community only	0	0	2	3
Inpatients, outpatients, community	2	3	2	3
Other	1	1	0	0
Unknown	16	--	1	--
<b>Age Grouping</b>				
<5 years	32	36	24	38
<3 years	4	5	9	14
< 1 year	5	6	2	3
Other	47	53	27	42
Multi-age	0	0	2	3
Unknown	0	--	1	--
<b>Includes Neonates</b>				
Yes	24	34	41	63
No	47	66	24	37
Unknown	17	--	0	--
<b>Eligibility Determination<sup>b</sup></b>				
Physicians	16	64	51	79
Clinical officers/physician assistants	1	4	20	31
Nurses	3	12	12	19
Other	5	44	7	11
Unknown	66	--	0	--
<b>Specimens Collected<sup>b</sup></b>				
NP swabs/nasal wash/nasal aspirate	43	49	48	74
Blood	67	77	51	79
Sera	33	38	19	29
Induced sputum	9	10	6	9
Lung aspirates	5	6	8	12
Pleural fluid	13	15	23	35
Post mortem specimens	3	3	2	3
Other	21	24	17	26
Unknown	1	--	0	--
<b>Lab tests<sup>b</sup></b>				
Blood culture	54	64	53	82
PCR	38	45	44	68
Serology	44	52	14	22
Urine antigen testing	6	7	14	19
Blood antigen testing	6	7	6	9
Other	24	29	8	12
Unknown	5	--	0	--
<b>Data Collection Start Date</b>				
2005 or earlier	77	90	14	26
2006 to 2010	9	10	40	74
Unknown	2	--	11	--

<sup>a</sup> Percentages do not include unknowns

<sup>b</sup> Question allowed multiple items to be checked so percentages may exceed 100%

NOTE: Due to rounding, totals may not sum to 100%; Literature Review and Survey results not mutually exclusive