

BURDEN OF *STREPTOCOCCUS PNEUMONIAE* DISEASES IN MAINLAND CHINA

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INTRODUCTION AND AIMS

- Pneumonia is the leading cause of child mortality in mainland China,¹ yet the etiology-specific burden remains unclear.
- To estimate the burden of pneumococcal disease in children and adults, we systematically reviewed the Chinese and English language literature for relevant data.

METHODS

Strategy

- Systematic evaluation of studies with cases identified between 1980-2010 reporting outcomes of interest from mainland China:
 - pneumococcal disease (PD) incidence or mortality rates,
 - pneumonia, meningitis, and invasive non-pneumonia non-meningitis (e.g. bacteremia without a focus) incidence or mortality rates,
 - the proportion of pneumonia, meningitis, and invasive non-pneumonia non-meningitis (NPNM) cases and deaths caused by pneumococci,
 - case fatality ratios (CFR), and
 - distribution of serotypes causing invasive pneumococcal disease (IPD).
- Sources of data: searches of the China National Knowledge Infrastructure (CNKI) and 16 other literature databases, data from contacted researchers and citation lists.
- Titles and abstracts of citations were double-screened for inclusion criteria:
 - Human study reporting primary data from cases ascertained \geq year 1980;
 - Report outcomes of interest including *Streptococcus pneumoniae* (SP) isolated from a normally sterile site; and
 - Representative of the general study population (i.e. no sub-population data, HIV is only exception).
- Data collection: Full-text articles were retrieved and double-screened; relevant data abstracted and assessed by quality criteria.
- Analysis: Values across studies were averaged by random effects meta-analysis.

RESULTS

SP Disease burden

- 58 studies reported pneumococcal disease (PD) data from mainland China; most (62%) were identified only from CNKI.
- Some data were available from most provinces in China (Figure 1).
- One study reported incidence of pneumococcal meningitis in children <5 years (0.98/100,000); no studies reported incidence of IPD or pneumococcal pneumonia.
- 31 studies estimated the %pneumonia or meningitis cases/deaths due to SP.
- Across age groups, studies (N=5) found 1-6% of community acquired pneumonia due to SP.
- A multi-site study of hospitalized pneumonia in 14 hospitals across mainland China found 48% of bacteremic pneumonia cases due to SP.
- The average % of meningitis cases due to SP by age group estimated by random effects meta-analysis was:
 - 5% (95% CI: 2-12%) among 0-4 year olds, and
 - 28% (95%CI: 17-45%) among older children and adults.
- Four studies reported SP meningitis CFR across age groups with an average of 14% (95% CI: 6-34%).

Figure 1. Included studies on invasive disease caused by *Streptococcus pneumoniae* by region in Mainland China.

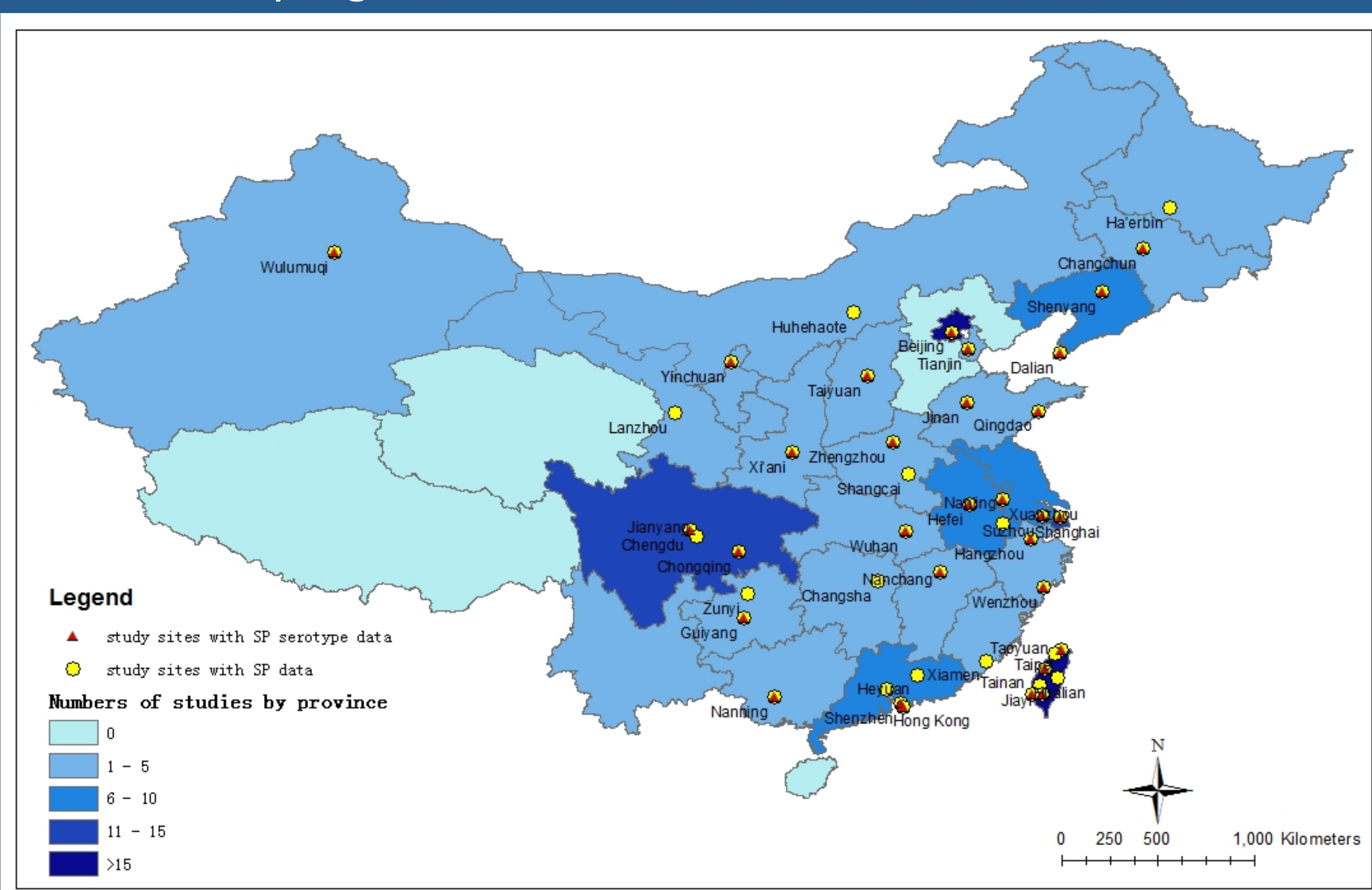
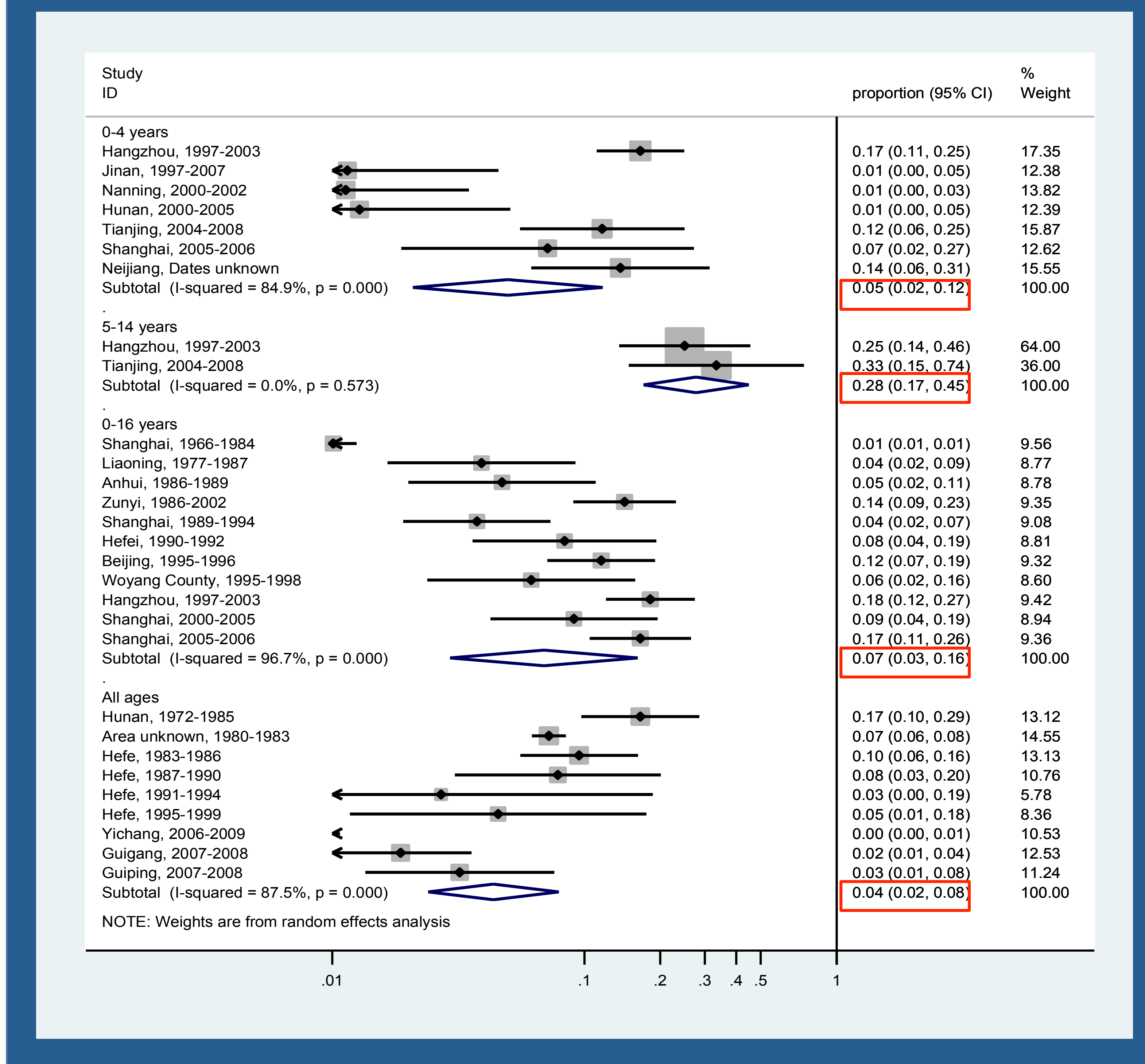


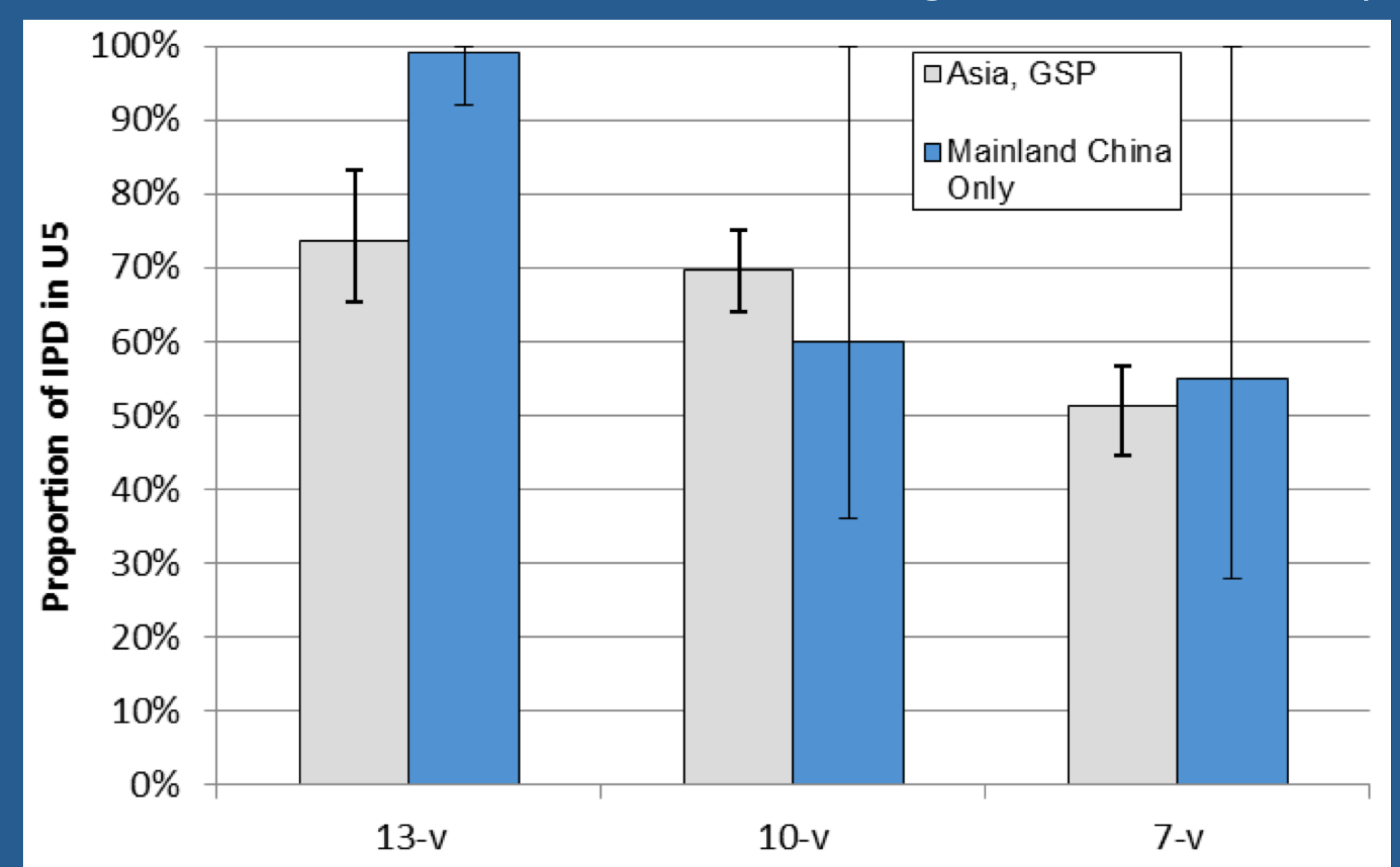
Figure 2. Forest Plot and meta-analysis of % meningitis due to SP.



IPD Serotypes

- Studies reporting IPD serotypes (N=3) were all identified from PubMed.
- Cumulative % of Top 10 serotypes for mainland China approximated published regional estimates (~68%).²
- Meta-estimates of IPD vaccine serotype coverage for existing 10-valent (10-v) and 13-valent (13-v) vaccines was $\geq 60\%$ among children in mainland China.

Figure 3. Proportion of IPD in children due to serotypes in existing PCV formulations Mainland China and the Asia region from GSP analyses*



* GSP, Pneumococcal Global Serotype Project²

CONCLUSION

- Searching the Chinese language literature is important to identify data on pneumococcal disease burden in mainland China.
- Limitations in the available data included: lack of epidemiologic data for lab identified cases, high rates of antibiotic pretreatment and reliance solely on culture methods.
- Despite limitations in the number of studies and their quality, etiology studies consistently demonstrate SP as an important cause of meningitis and pneumonia.
- Based on these local data, introduction of the 10-v or 13-v PCV could provide good serotype coverage for pediatric IPD prevention.

REFERENCES

- Rudan I, et al. Causes of deaths in children younger than 5 years in China in 2008. Lancet 2010;375(9720):1083-1089.
- Johnson HL, et al. Systematic Evaluation of Serotypes Causing Invasive Pneumococcal Disease among Children Under Five: The Pneumococcal Global Serotype Project. PLoS Med 2010;7(10): e1000348.