

Community-based Typhoid Vaccination Program in New Delhi, India

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Typhoid Fever

- Major public health problem in developing world, if left untreated- 30% mortality
- High Migrants load (unprotected vulnerable cohort) settling in slums
- Evidence of higher occurrence of culture positive Typhoid in 2-5 years children in slum
- Occurrence of typhoid was 44% in < 5 years.
- Total Expected Annual Losses/cost for each individual 5 times higher in child 2-5 yrs against those 5-19yrs

Typhoid Fever in Delhi

Typhoid fever in children aged less than 5 years

Anju Sinha, Sunil Sazawal, Ramesh Kumar, Seema Sood, Vankadara P Reddaiah, Bir Singh, Malla Rao, Abdolla Naficy, John D Clemens, Maharaj K Bhan

Age at follow-up (years)	Total follow-up (years)	Culture-confirmed cases (n)	Typhoid incidence* (95% CI)
Under 5	1027	28	27.3 (17.2 to 37.4)
0-1	166	0	..
>1-2	202	5	24.8 (3.1 to 46.5)
>2-3	213	11	51.6 (21.1 to 82.2)
>3-4	225	5	22.2 (2.7 to 41.7)
>4-5	221	7	31.7 (8.2 to 55.2)
Over 5-19	2743	32	11.7 (7.9 to 15.7)
≥5-12	1579	22	13.9 (8.1 to 19.8)
>12-19	1164	10	8.6 (3.3 to 13.9)
Over 19-40	2684	3	1.1 (-0.1 to 2.4)
Total	6454	63	9.8 (7.4 to 12.2)

*Incidence per 1000 person-years.

Table 1: Age-specific incidence of culture-confirmed typhoid detected by active surveillance over a 1-year period in urban Dehli

Typhoid Vaccination in Delhi

- Assured sustained Financial Resource
- Experience of successful Polio Program, Prior Experience MMR & Hepatitis B an advantage
- Strong political and bureaucratic commitment, relatively better performing system with adequate reach of services.

Delhi Health System's strength

- 600 fixed health facilities
 - Twice weekly at peripheral facilities
 - Once a week out-reach in underserved/un-served
- State & Regional Cold Chain adequate
- Training facility adequate
- Grand Total of sessions = 135,888 annually
- Total Reported Annual Antigens administered = 24,35,000
- Average Session vaccination rate= 17.92 per session
- Recommendation:
 - Integration in EPI feasible at no extra cost

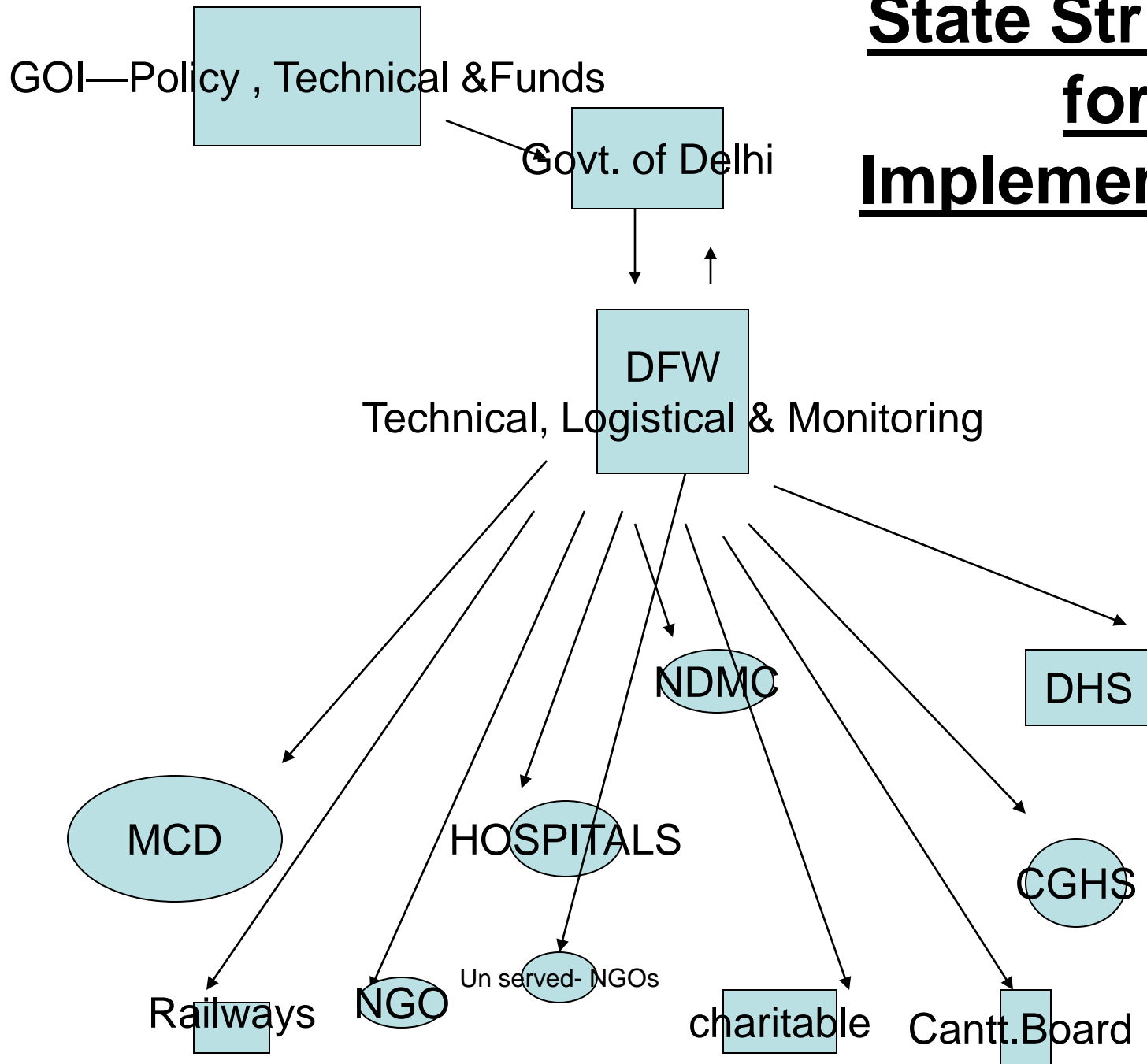
Delhi's Vaccination Program

- State Government began the program in 2004 targeting 2-5 year olds
- 300,000 - 325,000 children are vaccinated each year
- Vaccine procured locally at public sector price (~USD 0.50) from their own budget

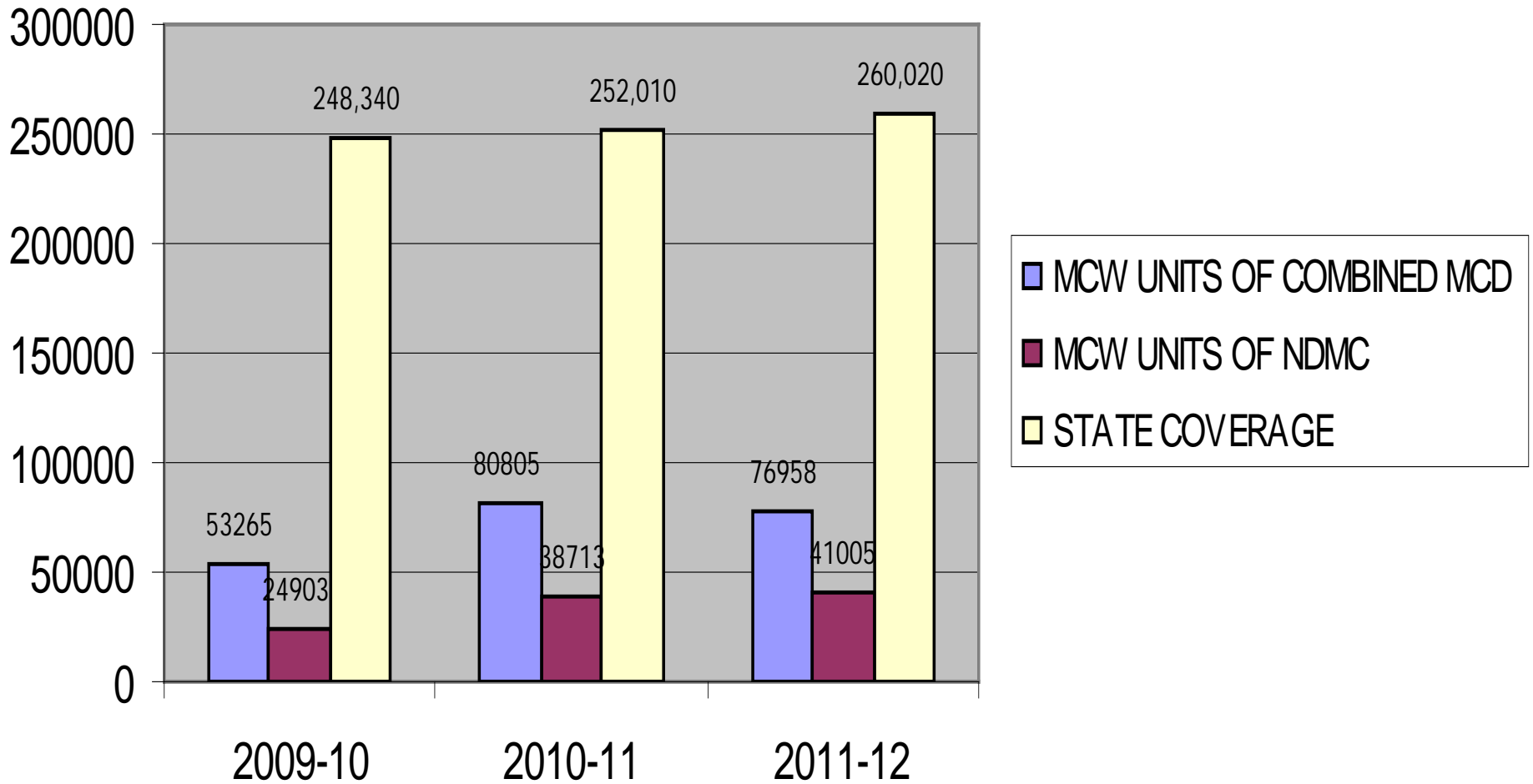
Evaluating the Program

- Recommendations from Typhoid meeting in 2009
 - Strengthen surveillance system
 - Evaluate Immunization Coverage
 - Evaluate impact of the vaccination from retrospective data of major hospitals
 - Conduct immunological assessment
 - Assess the cost of the program

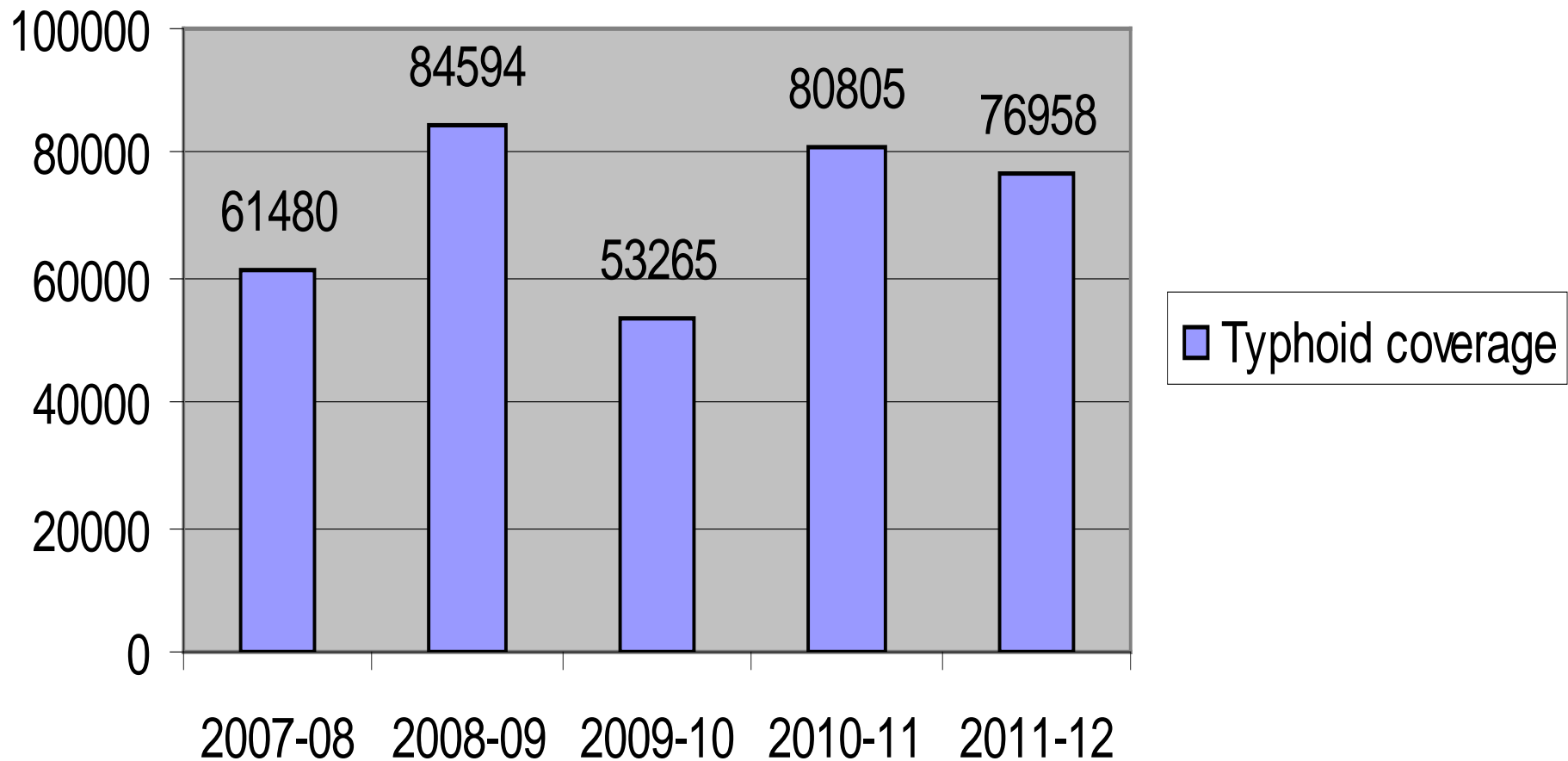
State Structure for Implementation



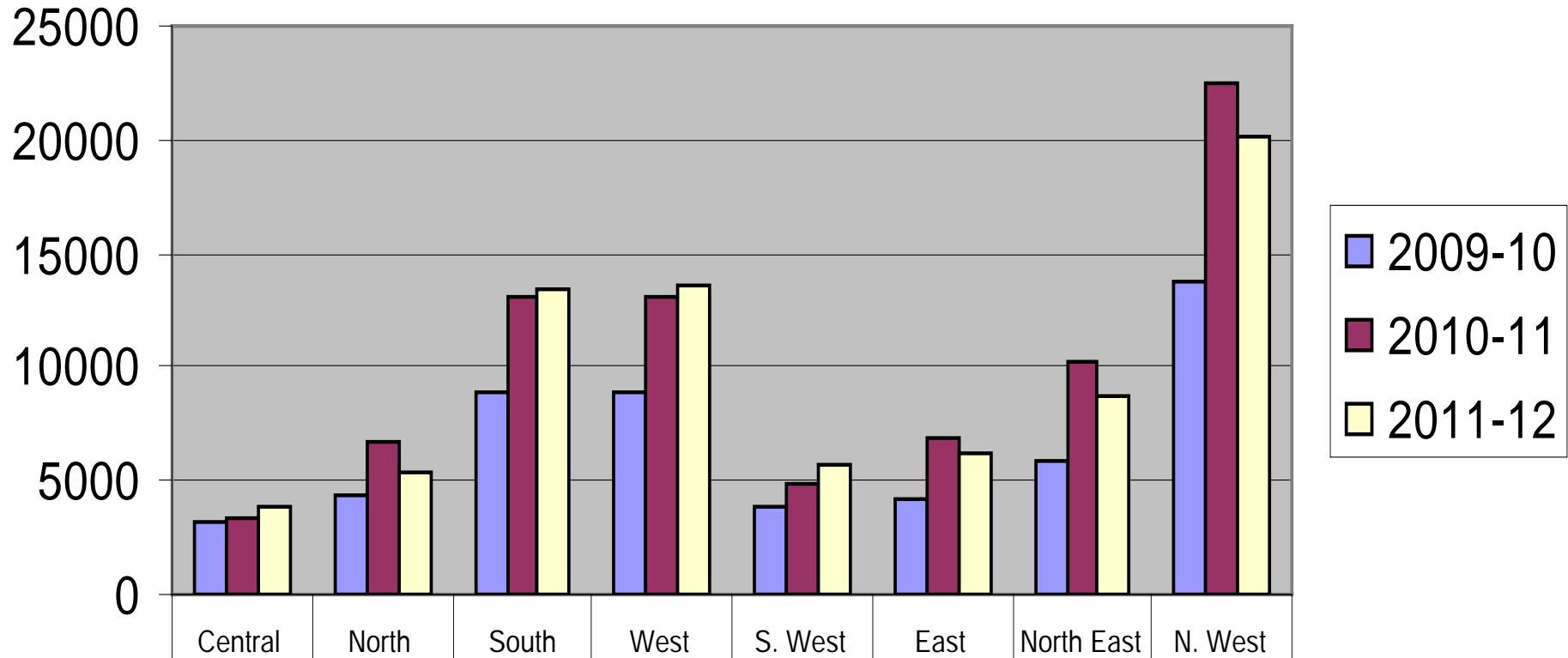
MCD, NDMC & state coverage



LAST 5 YEARS TYPHOID COVERAGE REPORT OF MCW UNITS OF COMBINED MCD



DISTRICT WISE TYPHOID COVERAGE REPORT OF MCW UNITS OF COMBINED MCD



■ 2009-10	3162	4371	8898	8951	3913	4246	5944	13780
■ 2010-11	3303	6632	13034	13083	4912	6854	10268	22422
■ 2011-12	3876	5328	13475	13531	5732	6174	8776	20066

Post Introduction Research

- Prospective study carried out on 250 children between 6 months to 5 years of age (at a medical college)
 - to determine sero-prevalence (baseline) of anti Vi antibodies and
 - to measure sero-response
- Fifty children each were enrolled
 - between 6 to 12 months of age (Group A),
 - between 1- 2 years of age(Group B),
 - between 2-3 years of age (Group C),
 - between 3-4 years of age (Group D) and
 - between 4-5 years of age (Group E).
- Anti-Vi antibody baseline titres were determined in all children.

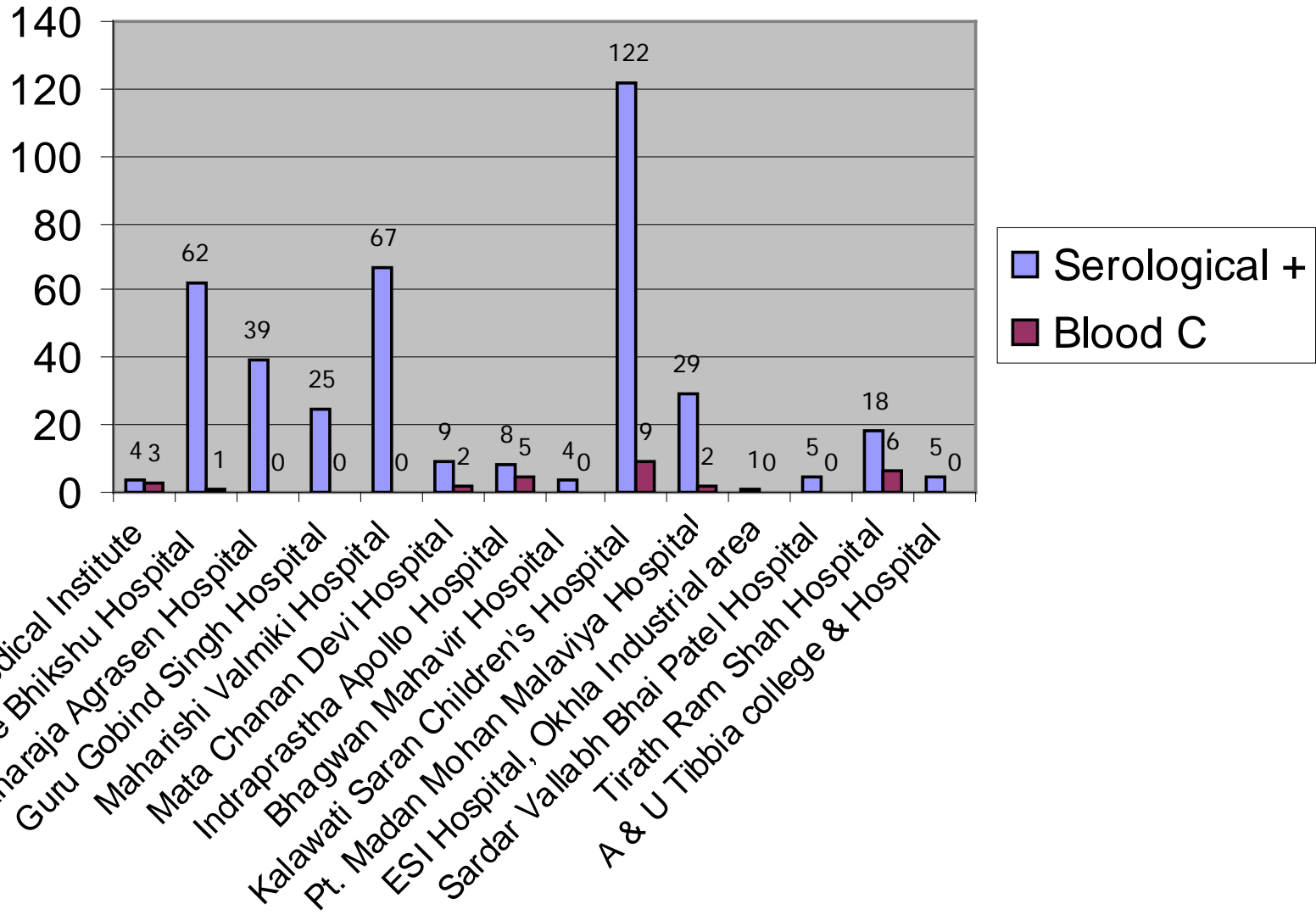
Results

- Mean pre-vaccination antibody titre of 0.321 – 0.333 micro gram/ml.
- Mean Post-vaccination antibody 1.825 – 2.349 micro gram/ml.
- More than four fold rise in antibody titre seen in all.
- The pre and post vaccination titre statistically significant ($p < 0.001$).
- Mean percentage rise in antibodies ranged 106.07% - 204.38%

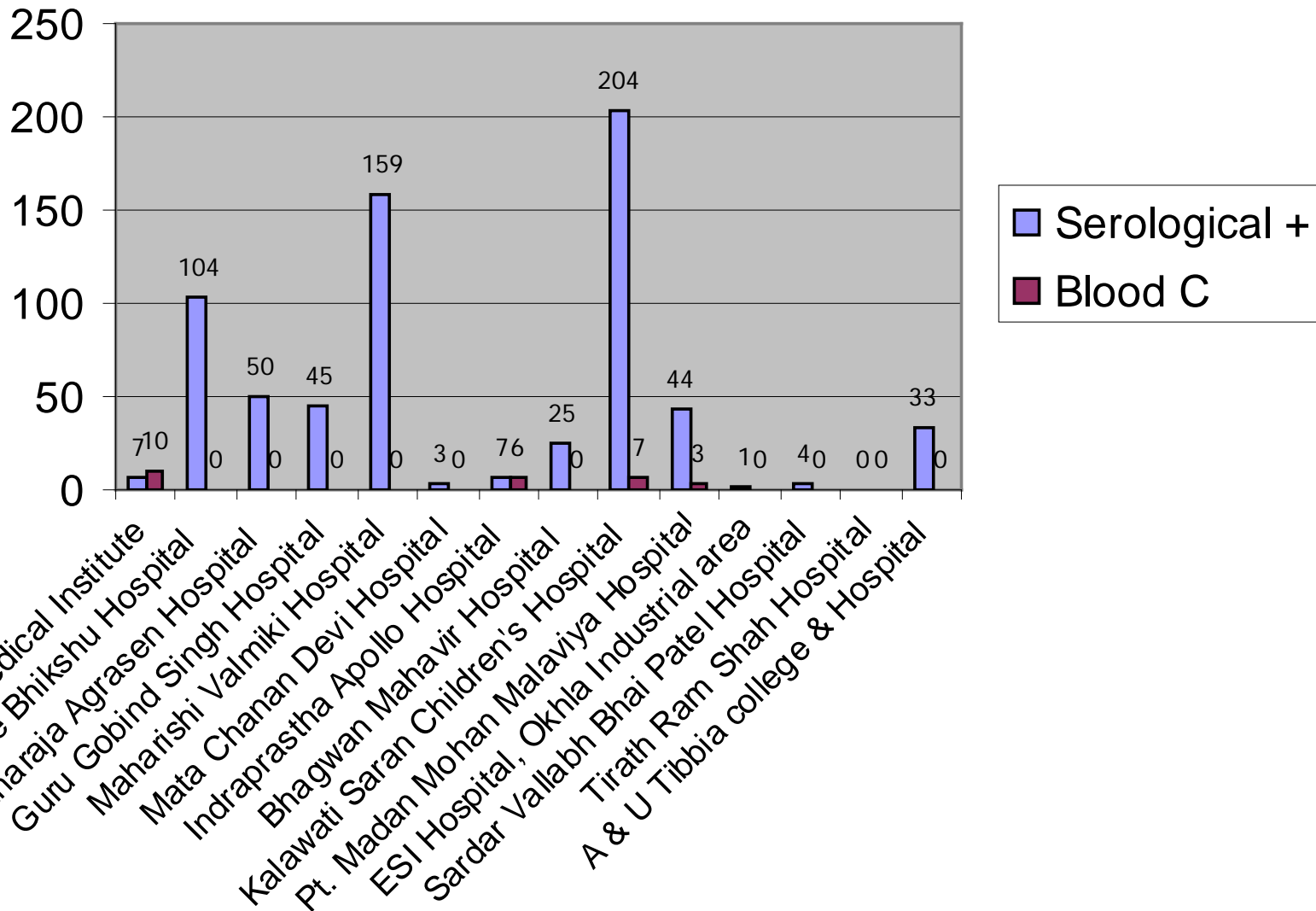
Post introduction research

- There were no significant adverse reactions following vaccination.
- The study highlights very low prevalence of baseline anti Vi antibodies in children between 6 months and less than 5 years of age
- Shows high immunogenicity and safety of Typhoid Vi polysaccharide vaccine in children 2-5 years of age.

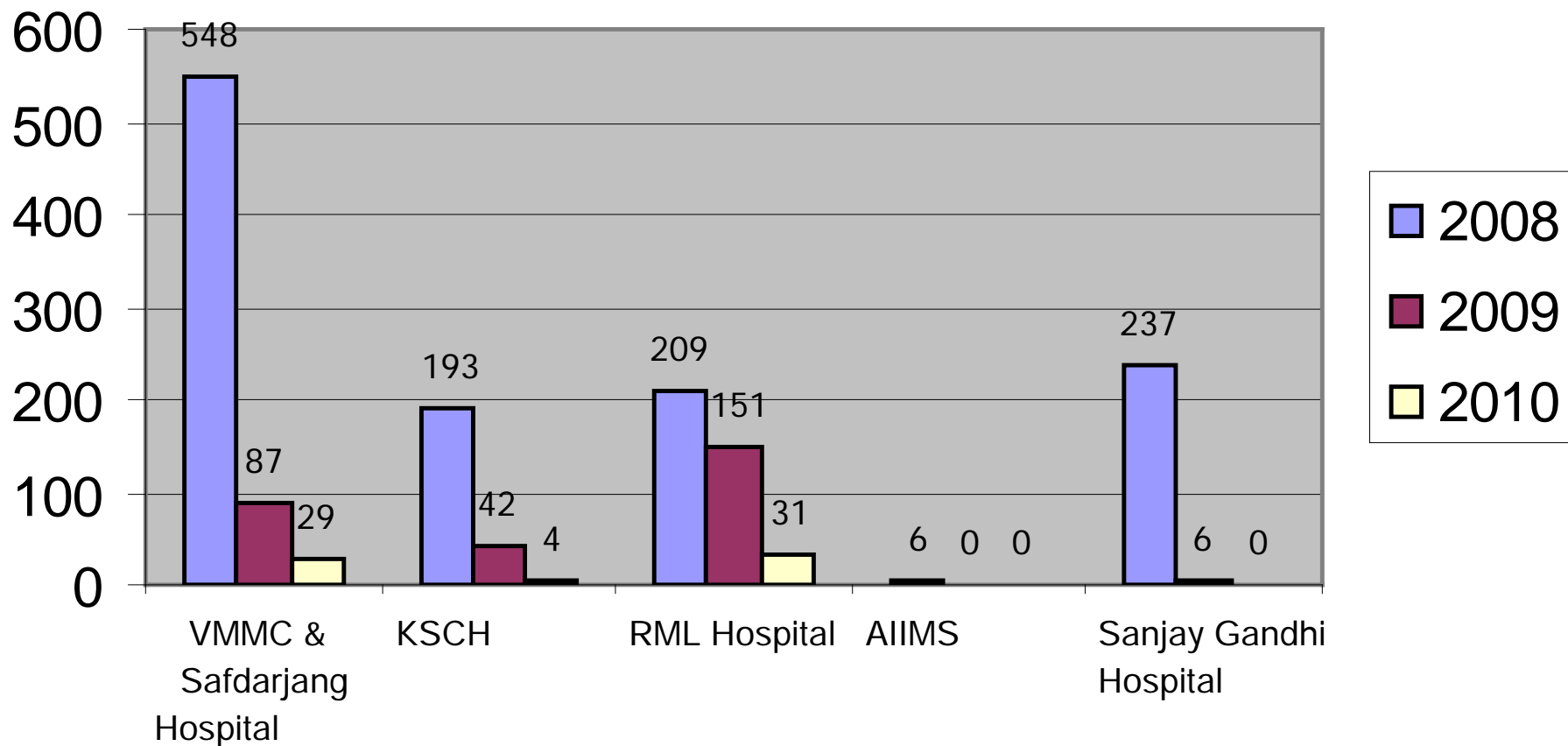
Hospital wise typhoid cases from Apr.-Dec.2012(<5 Year)



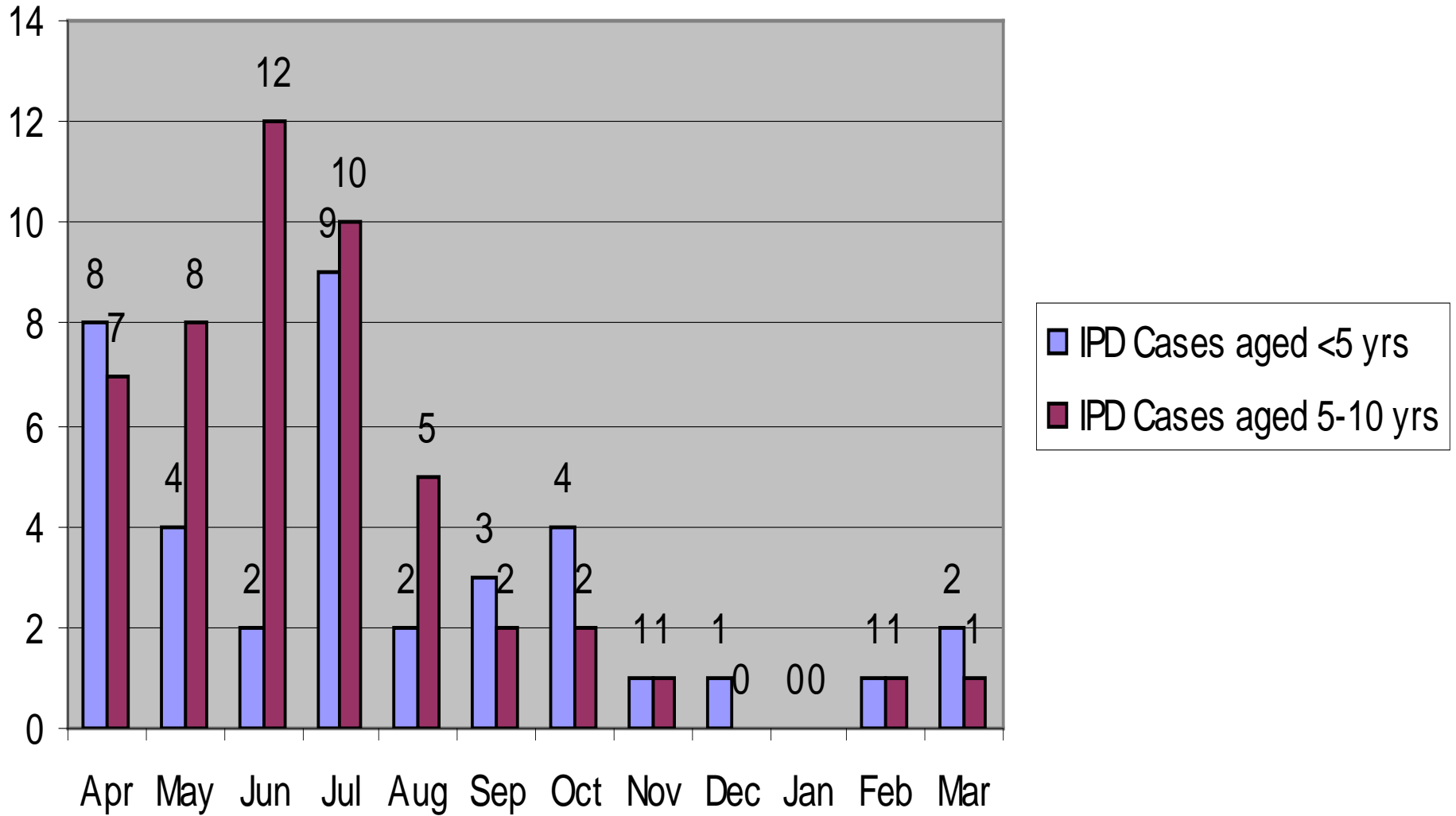
Hospital wise typhoid cases from Apr.-Dec.2012(5-10 Years)



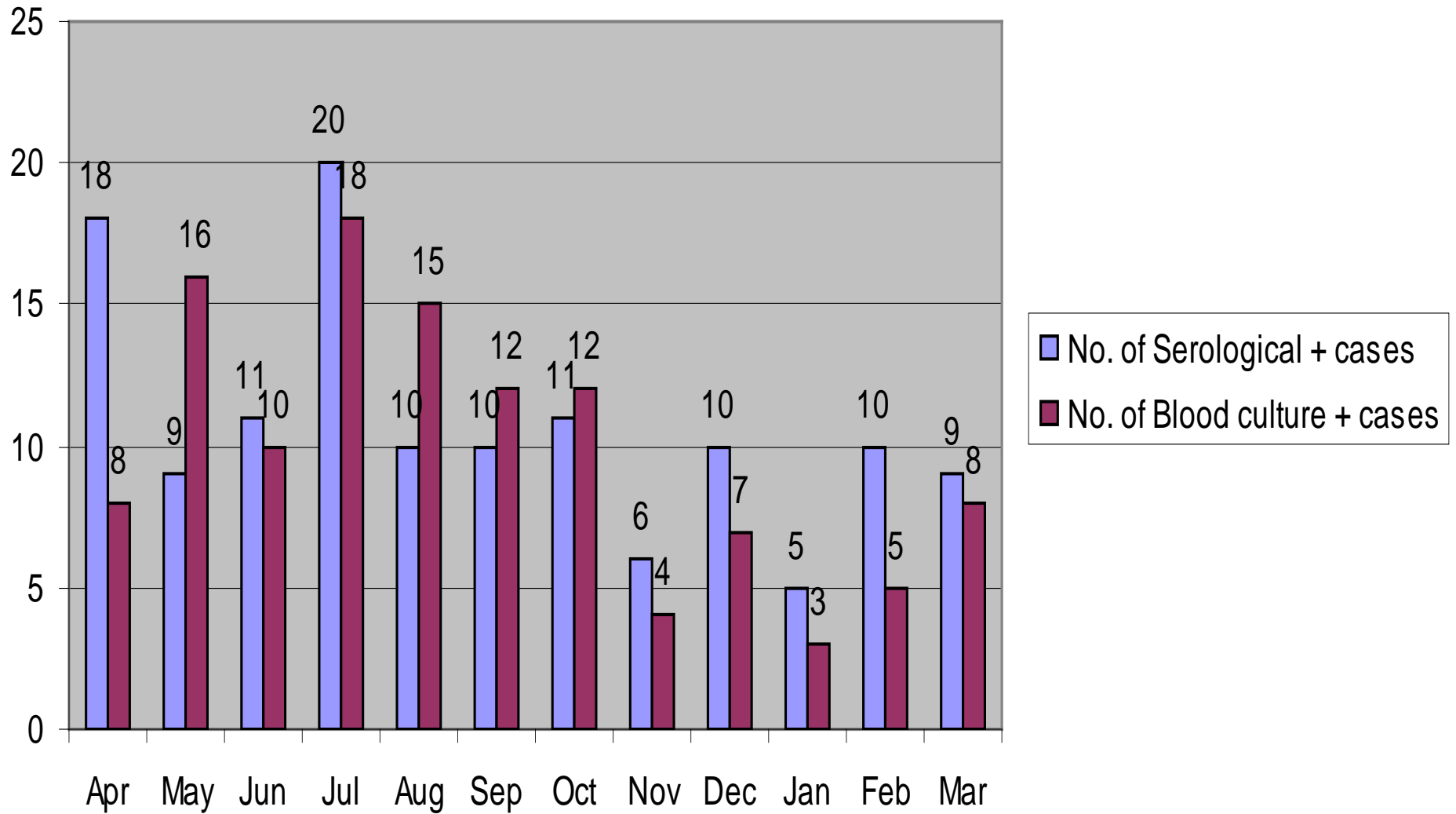
Typhoid cases comparision in major hospital (2008-2010)



Acharya Shree Bhikshu Hospital (2011-12)



Kalawati Saran Children Hospital (2011-12)



Estimated Financial Burden of the Disease

Private cost

INR 1,732

Non-patient cost

INR 1,865

Mean total cost

INR 3,597

- Mean total cost if hospitalized: INR 18,131
- Mean total cost if not hospitalized: INR 2,111
- Total Expected Annual Losses/cost for each individual 5 times higher in child 2-5 yrs against those 5-19yrs

Estimation of Financial saving & Implication during last 4 yrs (till March, 2009)

Input data:

- 10 lacs (1,000,000) children vaccinated
- Protection from Vi vaccine: 70%
- Incidence of typhoid: 9.7/1,000/yr
- Cost of illness (inpatient): INR 18,131 / blood culture confirmed typhoid
- Cost of illness (outpatient): INR 2,111 / blood culture confirmed typhoid
- Inpatient to Outpatient ratio: 2 / 8

	Population at risk	Cases in 4 years	Cases averted	
No Vaccine	1,000,000	11,600		
With Vaccine	300,000	3,480	8,120	
	Inpatient cost	Outpatient cost	Total cost saved	
Cost of illness	INR 98,487,592	INR 45,867,808	INR 144,355,400	USD 3,608,885
	Vaccines (INR 30 ea.)	IEC cost (INR 500,000/yr)	Total cost used	
Cost of program	INR 30,000,000	INR 2,000,000	INR 32,000,000	USD 800,000

Future Perspectives

- Continue current surveillance efforts
- Further studies:
 - Community based KAP
 - Community based follow up (stool culture) 3 months and 12 months after discharge to find out carrier status/ incidence
- Develop and Advocate for Vaccination Policy for children >5 years & adolescents in Delhi and beyond