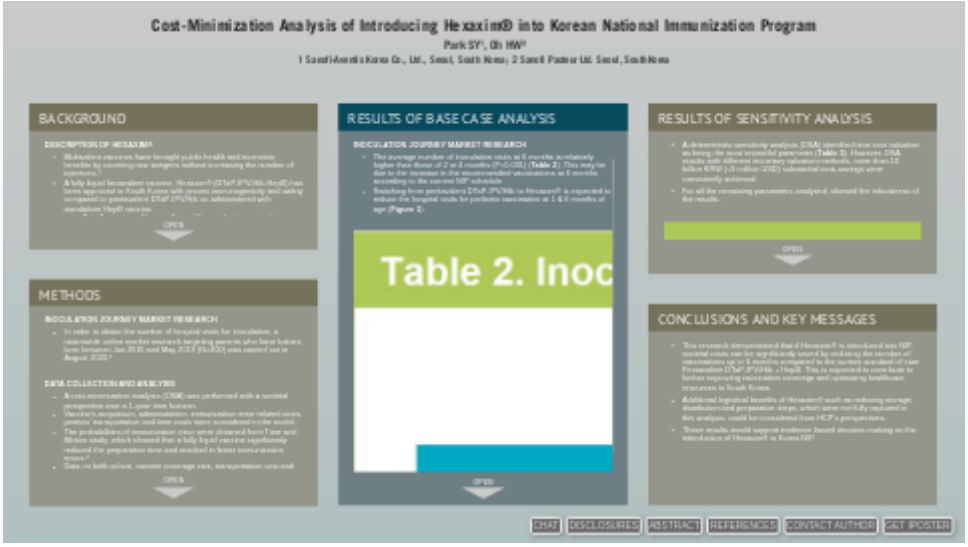
Cost-Minimization Analysis of Introducing Hexaxim® into Korean National Immunization Program



Park SY[1], Oh HW[2]

1 Sanofi-Aventis Korea Co., Ltd., Seoul, South Korea; 2 Sanofi Pasteur Ltd. Seoul, SouthKorea

PRESENTED AT:

BACKGROUND

DESCRIPTION OF HEXAXIM®

- Multivalent vaccines have brought public health and economic benefits by covering new antigens without increasing the number of injections.[1]
- A fully liquid hexavalent vaccine, Hexaxim® (DTaP-IPV-Hib-HepB) has been approved in South Korea with proven immunogenicity and safety compared to pentavalent DTaP-IPV/Hib co-administered with standalone HepB vaccine.
  - **6-in-1 vaccine** : Hexaxim® simplifies pediatric vaccination schedules by providing protection against 6 vaccine preventable diseases in 1 injection and contributes to increase vaccination acceptance by fewer injections.
  - **Ready-to-use (RTU)** : Hexaxim® fully-liquid vaccine, available as single dose vial increases efficiency and reduces vaccine related errors (VREs) due to reconstitution.

OBJECTIVE

- This research aims to evaluate the socio-economic impact of introducing Hexaxim® in Korean national immunization program (NIP).

METHODS

INOCULATION JOURNEY MARKET RESEARCH

- In order to obtain the number of hospital visits for inoculation, a nationwide online market research targeting parents who have babies born between Jan 2016 and May 2019 (N=400) was carried out in August 2020.[3]

DATA COLLECTION AND ANALYSIS

- A cost-minimization analysis (CMA) was performed with a societal perspective over a 1-year time horizon.
- Vaccine's acquisition, administration, immunization error related costs, parents' transportation and time costs were considered in the model.
- The probabilities of immunization error were obtained from Time and Motion study, which showed that a fully liquid vaccine significantly reduced the preparation time and resulted in fewer immunization errors.[2]
- Data on birth cohort, vaccine coverage rate, transportation cost and hourly gross wage were collected from official national sources.
- Parents' time costs were estimated by Opportunity Cost Methods, but different approaches also explored in the sensitivity analysis.
- All costs were adjusted to 2020 values.

Table 1. CMA Model Inputs

	Values		Reference
Birth cohort in 2021	290,000 (Medium-growth scenario)		KOSIS [4]
Completion of DTaP 3 doses at 12 months	97.4%		KDCA [5]
Valuation of time cost			
Monetary valuation methods	Opportunity cost methods		
Required time for inoculation visits	4 hours (Half-day leave)		
Employment rate	Not considered (Broad approach)		
Hourly wage	KRW 20,573		KOSIS [7]
Immunization channel	100% Private Clinic		Assumed
Transportation cost per inoculation visit	KRW 3,932		KNHANES [8]; KOSIS [9]
	Pentavalent DTaP-IPV/Hib + HepB	**Hexaxim® + HepB**	**Reference**
Vaccine acquisition cost / inoculation fee	NIP List price in 2020	Assumed *	KDCA [6]
0m-6m total inoculation visits	6.6	5.2	Market research [3]
0m-6m total reconstitution per child	3.0	0.0	MFDS [10]
Probability of immunization error			
Spillage risk	1%	0%	Time and Motion [2]
Risk to forget Hib	1%	0%	

** Assumption based on expected NIP list price*

RESULTS OF BASE CASE ANALYSIS

INOCULATION JOURNEY MARKET RESEARCH

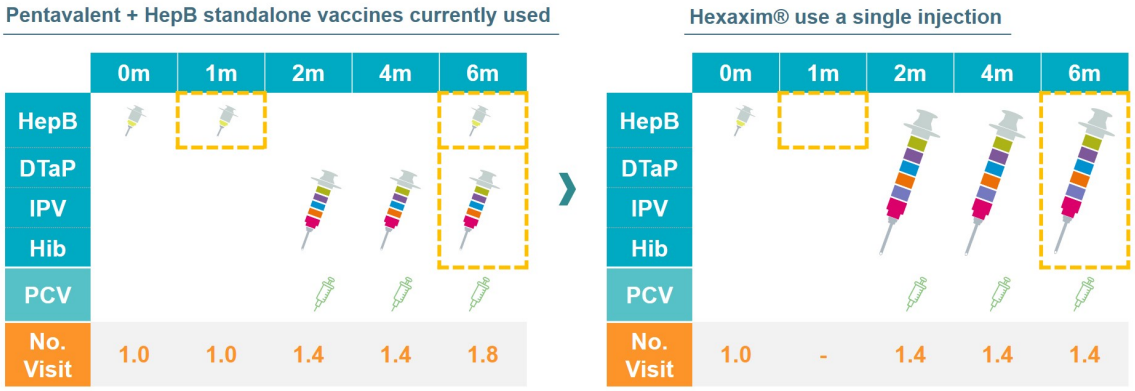
- The average number of inoculation visits at 6 months is relatively higher than those of 2 or 4 months (P<0.001) (**Table 2**). This may be due to the increase in the recommended vaccinations at 6 months according to the current NIP schedule.
- Switching from pentavalent DTaP-IPV/Hib to Hexaxim® is expected to reduce the hospital visits for pediatric vaccination at 1 & 6 months of age (**Figure 1**).

Table 2. Inoculation Visit Patterns with Pentavalent DTaP-IPV/Hib

	2 months (N=227)		4 months (N=263)		6 months (N=270)	
Number of hospital visit for pediatric inoculation	N	%	N	%	N	%
1	125	55%	151	57%	108	40%
2	102	45%	112	43%	116	43%
3	-	0%	-	0%	46	17%
4	-	0%	-	0%	-	0%
5	-	0%	-	0%	-	0%
Mean	1.4		1.4		1.8 ***	

*** P<0.001; The average number of hospital visit for pediatric inoculation at 6months showed significantly higher vs. 2 and 4 months.

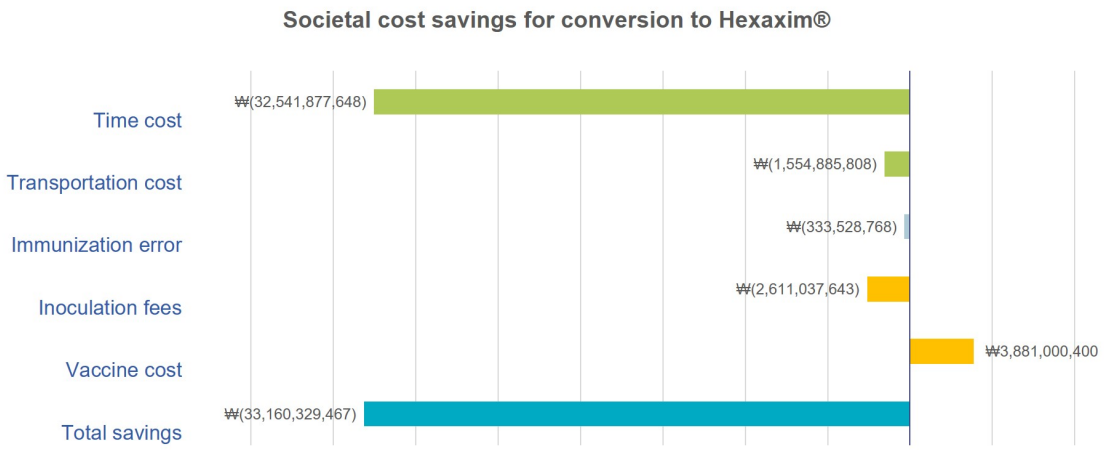
Figure 1. Simplification of Pediatric Immunization Schedule with Hexaxim®



CMA MODEL RESULTS

- If South Korea switches from the current pentavalent DTaP-IPV/Hib plus HepB to Hexaxim® for NIP, it will provide 33.2 billion KRW (=29 million USD) substantial cost-savings in 2021.
- This was mainly attributable to parents' time savings by reducing hospital visits. Reducing transportation, inoculation fee and immunization errors were also contributing factors (**Figure 2**).

Figure 2. CMA Model Results – Base Case



RESULTS OF SENSITIVITY ANALYSIS

- A deterministic sensitivity analysis (DSA) identified time cost valuation as being the most impactful parameter (**Table 3**). However, DSA results with different monetary valuation methods, more than 10 billion KRW (=9 million USD) substantial cost-savings were consistently achieved.

- For all the remaining parameters analyzed, showed the robustness of the results.

Table 3. CMA Model Results - Sensitivity Analysis

		Cost savings for conversion to Hexaxim®		
		Per Child	Total population	
Base case		~~₩~~ 117,398	~~₩~~ 33,160,329,467	-$ 29,028,932
Deterministic Sensitivity Analysis		**Per Child**	**Total population**	
Birth cohort	Low-growth scenario (246,000) [4]	~~₩~~ 117,398	~~₩~~ 28,129,107,065	-$ 24,624,542
Vaccine cost / Inoculation fee	NIP List price in 2021 [11]	~~₩~~ 107,380	~~₩~~ 30,330,444,641	-$ 26,551,618
Immunization error	Korea RTU study [12]	~~₩~~ 116,362	~~₩~~ 32,867,673,081	-$ 28,772,737
Immunization channel	PHC channel (2.9%) considering [13]	~~₩~~ 117,098	~~₩~~ 33,075,368,889	-$ 28,954,556
Scenario Analysis of Time Cost Valuation		**Per Child**	**Total population**	
Opportunity Cost Methods	**Half-day leave | 66.3% employment** [14]	**~~₩~~ 78,573**	**~~₩~~ 22,193,716,700**	**-$ 19,428,634**
	Full-day leave | 66.3% employment [14]	**~~₩~~ 154,956**	**~~₩~~ 43,768,981,580**	**-$ 38,315,867**
Proxy Good Methods	**2 hours | babysitter hourly wage** [15]	**~~₩~~ 38,198**	**~~₩~~ 10,789,271,499**	**-$ 9,445,052**
	3 hours | babysitter hourly wage [15]	**~~₩~~ 56,202**	**~~₩~~ 15,874,681,339**	**-$ 13,896,878**

CONCLUSIONS AND KEY MESSAGES

- This research demonstrated that if Hexaxim® is introduced into NIP, societal costs can be significantly saved by reducing the number of vaccinations up to 6 months compared to the current standard of care Pentavalent DTaP-IPV/Hib + HepB. This is expected to contribute to further improving vaccination coverage and optimizing healthcare resources in South Korea.

- Additional logistical benefits of Hexaxim® such as reducing storage, distribution and preparation steps, which were not fully captured in this analysis, could be considered from HCP’s perspectives.

- These results would support evidence-based decision-making on the introduction of Hexaxim® in Korea NIP.

DISCLOSURES

This study was conducted and funded by Sanofi Pasteur. Park SY is an employee of Sanofi-Aventis Korea and hold Sanofi stock. Oh HW is an employee of Sanofi Pasteur.

ABSTRACT

OBJECTIVES:

Multivalent vaccines have brought public health and economic benefits by covering new antigens without increasing the number of injections. A fully liquid hexavalent vaccine, Hexaxim® (DTaP-IPV-Hib-HepB) has been approved in Korea with proven immunogenicity and safety compared to pentavalent DTaP-IPV/Hib with standalone Hep B vaccine. This research aims to evaluate the socio-economic impact of introducing Hexaxim® in Korea NIP.

METHODS

A cost-minimization analysis was performed with a societal perspective over a 1-year time horizon. Vaccines acquisition, administration, immunization error related costs, parents' transportation and time costs were considered in the model. The probabilities of immunization error were obtained from Time and Motion study, which showed that a fully liquid vaccine significantly reduced the preparation time and resulted in fewer immunization errors. Data on birth cohort, vaccine coverage rate, transportation cost and hourly gross wage were collected from official national sources. In order to obtain the number of hospital visits for inoculation, a nationwide online market research (N=400) was carried out in August 2020. Parents' time costs were estimated by Opportunity Cost Methods, but different approaches also explored in the sensitivity analysis.

RESULTS:

If Korea switches from the current pentavalent DTaP-IPV/Hib plus HepB to Hexaxim® for NIP, it will provide 33.2 billion KRW (=29 million USD) substantial cost-savings over the coming year. This was mainly attributable to parents' time savings by reducing hospital visits. Reducing transportation, inoculation fee and immunization errors were also contributing factors. Sensitivity analyses indicated that results were robust to the different valuation approaches.

CONCLUSION:

Our research demonstrates the socio-economic value of Hexaxim® beyond clinical evidences. Additional practical benefits of Hexaxim® such as reducing storage, distribution and preparation steps, which were not fully captured in this analysis, could be considered from HCP's perspectives. These results would support evidence-based decision-making on the introduction of Hexaxim® in Korea NIP.

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