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Exercise

Multi Criteria Decision Analysis

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Aim of the exercise

Rank 3 vaccine products which can be used in a national vaccine campaign

- **Vaccine 1**
- **Vaccine 2**
- **Vaccine 3**

What we will accomplish by the end of this exercise?

- Understand how to Rank Vaccine Products using MCDA method
- Step by Step Approach to perform MCDA
- Analyse the Results

Steps by Step Approach

Step 1: Decision Criteria for Comparison:

Health impact	Deaths averted
Coverage	Number of fully immunized children
Safety	Number of vaccine related side effects
Commodity cost	Cost of commodity (including delivery technology & safety boxes)
Delivery cost	Storage and delivery cost

Step2: Weights for the Decision Criteria:

		Weights
Health impact	Deaths averted	20%
Coverage	Number of fully immunized children	20%
Safety	Number of vaccine related side effects	20%
Commodity cost	Cost of commodity (including delivery technology & safety boxes)	20%
Delivery cost	Storage and delivery cost	20%

Steps continued..

Step 3: Scoring Methodology

Formula for absolute scoring

$$\frac{Benefits\ obtained}{Maximum\ possible\ benefits}\ \text{x}\ 100$$

- Absolute score is obtained between 1 to 100
- Vaccine which performs better in a category obtains a better score

		Best Vaccine Profile (Most benefits/ less expensive)	**Worst Vaccine Profile** (Least benefits / more expensive)
Health impact	**Deaths averted**		
Coverage	**Number of fully immunized children**		
Safety	**Number of vaccine related side effect**		
Commodity cost	**Cost of commodity (including delivery technology and safety boxes)**		
Delivery cost	**Storage and delivery cost**		

Use the table 1 to generate a best vaccine and worst vaccine profile in the scoring table

Table 1. Characteristics/ performance of the vaccine products					
Vaccine products	**Rotavirus deaths**	**Number of fully immunized children**	**Number of vaccine related side effect**	**Cost of commodity (including delivery technology and safety boxes)**	**Storage cost**
No Vaccine	120	0 (14000 children)	0	0	0
Vaccine-1	97	7823	2	2	14,322
Vaccine-2	85	4599	2	3.5	12871
Vaccine-3	88	10021	3	9	11325

→ **Please update your scoring tables now**

Scoring Table

		Best Vaccine Profile (Most benefits/ less expensive)	**Worst Vaccine Profile** (Least benefits / more expensive)
Health impact	**Deaths averted**	All deaths averted	No deaths averted
Coverage	**Number of fully immunized children**	All children immunized	No children immunized
Safety	**Number of vaccine related side effect**	No vaccine related SE per 100,000 children immunized	Max number of vaccine related SE per 100,000 children immunized
Commodity cost	**Cost of commodity (including delivery technology and safety boxes)**	Cheapest commodity cost possible/ No cost	Highest commodity cost
Delivery cost	**Storage and delivery cost**	No additional storage and delivery cost possible	Highest storage and delivery cost

Updated Scoring Table

Scoring Table

		Best Vaccine Profile (Most benefits/ less expensive)	Worst Vaccine Profile (Least benefits / more expensive)
Health impact	**Deaths averted**	120	0
Coverage	**Number of fully immunized children**	14000	0
Safety	**Number of vaccine related side effect**	0	3
Commodity cost	**Cost of commodity (including delivery technology and safety boxes)**	0	9
Delivery cost	**Storage and delivery cost**	0	14,322

Table 1. Characteristics/ performance of the vaccine products

Vaccine products	Rotavirus deaths	Number of fully immunized children	Number of vaccine related side effect	Cost of commodity (including delivery technology and safety boxes)	Storage cost
No Vaccine	120	0 (14000 children)	0	0	0
Vaccine -1	97	7823	2	2	14,322
Vaccine -2	85	4599	2	3.5	12871
Vaccine - 3	88	10021	3	9	11325

Step-4 Generate Absolute Scores for vaccine products for each category

- Vaccine which performs better in a category obtains a better score

$$\frac{Benefits\ obtained}{Maximum\ possible\ benefits}\ \mathbf{x\ 100}$$

For example: Health Impact

Absolute Score

(vaccine 1) $= \frac{Deaths\ avoided\ by\ vaccine\ 1}{Maximum\ deaths\ which\ can\ be\ avoided}\ \mathbf{x\ 100}$

$= \frac{Deaths\ avoided\ by\ vaccine\ 1}{(best\ case - worst\ case)}\ x\ 100$

$= \frac{(120-97)}{(120-0)}\ \mathbf{x\ 100 =\ 19}$

Scoring formula (Absolute scores)

- Health Impact: $\frac{Deaths\ averted}{(Best\ case - worst\ case)}$ x 100

- Coverage: $\frac{\#\ Fully\ immunized\ children\ (FIC)}{(Best\ case - worst\ case)}$ x 100

- Safety: $\frac{\#\ SE\ \ cases\ avoided}{(Best\ case - worst\ case)}$ x 100

- Commodity cost:

$$\frac{How\ cheap\ is\ the\ product\ from\ the\ most\ expensive}{(Best\ case - worst\ case)}\ \text{x 100}$$

- Delivery cost: $\frac{How\ cheap\ is\ the\ delivery\ from\ the\ most\ expensive}{(Best\ case - worst\ case)}$ x 100

SE: side effect

Let's check the Scores for Vaccine 1

→ **Please update absolute scores for vaccine 1 now**

Scoring table		Best case (Most benefits/ less expensive)	Worst case (Least benefits / more expensive)	Absolute Scores (Vaccine -1)
Health impact	Deaths averted	120	0	**19**
Coverage	Number of Fully immunized children	14000	0	**56**
Safety	Number of vaccine related side effect	0	3	**33**
Commodity cost	Cost of commodity (including delivery technology and safety boxes)	0	9	**78**
Delivery cost	Storage and delivery cost	0	14,322	**0**

Scoring for all Vaccine Products

Please update absolute scores for vaccine 2 and 3 now

Decision Criteria	Worst Vaccine (Least benefits / more expensive)	Best Vaccine (Most benefits/ less expensive)	Vaccine Scores (absolute)		
			Vaccine 1	Vaccine 2	Vaccine 3
Health impact	0	120	19	29	27
Coverage	0	14000	56	33	72
Safety	3	0	33	33	0
Commodity cost	9	0	78	61	0
Delivery cost	14,322	0	0	10	21

Step5: Obtain Weighted Scores for the vaccines

→ Please update weighted scores now

Weighted score = Absolute score * Weights

Decision Criteria	Weights	Vaccine 1		Vaccine 2		Vaccine 3	
		Absolute	Weighted	Absolute	Weighted	Absolute	Weighted
Health impact	20%	19	4	29	6	27	5
Coverage	20%	56	11	33	7	72	14
Safety	20%	33	7	33	7	0	0
Commodity cost	20%	78	16	61	12	0	0
Delivery cost	20%	0	0	10	2	21	4
Total Score		**SUM:**	**37**	**SUM:**	**33**	**SUM:**	**24**
RANK			**1ST**		**2ND**		**3RD**

Results

- Different vaccine products perform the best in different criteria's
- Vaccine 1 is the preferred vaccine product based on MCDA

Decision Criteria	Weights	Vaccine 1		Vaccine 2		Vaccine 3	
		Absolute	Weighted	Absolute	Weighted	Absolute	Weighted
Health impact	20%	19	4	29	6	27	5
Coverage	20%	56	11	33	7	72	14
Safety	20%	33	7	33	7	0	0
Commodity cost	20%	78	16	61	12	0	0
Delivery cost	20%	0	0	10	2	21	4
Total Score		**SUM:**	**37**	**SUM:**	**33**	**SUM:**	**24**

Thank you!