Ranking Vaccines: Applications of a Prioritization Software Tool

Committee on Identifying and Prioritizing New Preventive Vaccines for Development, Phase III

NVAC, 10 February 2015
A Multi-User Approach

2012
http://www.nap.edu/catalog.php?record_id=13382

2013
http://www.nap.edu/catalog/13531/ranking-vaccines-a-prioritization-software-tool-phase-ii-prototype-of

2014
http://www.nap.edu/catalog.php?record_id=18763
## A Multi-Criteria Approach

| Health Considerations                      | • Premature Deaths Averted per Year  
|                                          | • Incident Cases Prevented per Year  
|                                          | • QALYs Gained or DALYs Averted         |
| Economic Considerations                   | • Net Direct Costs (Savings) of Vaccine Use per Year  
|                                          | • Workforce Productivity Gained per Year  
|                                          | • One-Time Costs                       
|                                          | • Cost-Effectiveness ($/QALY or $/DALY)  |
| Demographic Considerations                | • Benefits Infants and Children        
|                                          | • Benefits Women                      
|                                          | • Benefits Socioeconomically Disadvantaged 
|                                          | • Benefits Military Personnel         
|                                          | • Benefits Other Priority Population   |
| Public Concerns                           | • Availability of Alternative Public Health Measures  
|                                          | • Potential Complications Due to Vaccines  
|                                          | • Disease Raises Fear and Stigma in the Public  
|                                          | • Serious Pandemic Potential           |
| Scientific and Business Considerations    | • Likelihood of Financial Profitability for the Manufacturer  
|                                          | • Demonstrates New Production Platforms  
|                                          | • Existing or Adaptable Manufacturing Techniques  
|                                          | • Potential Litigation Barriers Beyond Usual  
|                                          | • Interests from NGOs and Philanthropic Organizations |
| Programmatic Considerations               | • Potential to Improve Delivery Methods  
|                                          | • Fits into Existing Immunization Schedules  
|                                          | • Reduces Challenges Relating to Cold-Chain Requirements |
| Intangible Values                         | • Eradication or Elimination of the Disease  
|                                          | • Vaccine Raises Public Health Awareness  |
| Policy Considerations                     | • Interest for National Security, Preparedness, and Response  
|                                          | • Advances Nation’s Foreign Policy Goals |
| User-Defined Attributes                   | • Up to Seven Attributes               |

A compliant version of the table can be found on Page 34
Key New Features in SMART Vaccines 1.1

www.nap.edu/smartvaccines
Expanded Set of Nations

SMART Vaccines

Specify:
- Population
- Disease
- Vaccine

Evaluate:
- Attributes
- Weights
- Priorities

Select the country or region and sub-population. NOTE: SMART Scores are calculated for the total population.

Population:
- select
- UnitedStates
- Australia
- Austria
- Belgium
- Canada
- Chile
- CzechRepublic
- Denmark
- Estonia
- Finland
- France
- Germany
- Greece
- Hungary
- Iceland
- India
- Ireland
- Israel
- Italy
## SMART Vaccines

Select vaccine candidates to compare. Set attributes and scores. View SMART Score calculated for total population.

NOTE: Orange highlighted scores have been altered in Analysis; Vaccine Profile.

### United States Vaccine Candidates: Values (Scores)

| Attributes Selected                        | Pneum|vaccine1 | HPV|vaccine1 | Rota|vaccine1 | Flu|vaccine1 | TB|vaccine1 |
|-------------------------------------------|------|----------|-------|----------|--------|----------|----------|----------|
| Incident Cases Prevented per Year         | 6562 | (0)      | 2340  | (0)      | 222928 | (4)      | 6119401  | (122)    | 6580     | (0)      |
| Quality adjusted life-years (QALYs) Gained| 7725 | (8)      | 13416 | (13)     | 2965   | (3)      | 136271   | (136)    | 7035     | (7)      |
| Cost-Effectiveness ($/QALY)               | -1030| (101)    | -3264 | (103)    | 54194  | (46)     | 10836    | (89)     | 118126   | (-18)    |
| Demonstrates New Production Platforms     | yes  | (100)    | yes   | (100)    | yes    | (100)    | yes      | (100)    | no       | (0)      |
| Existing or Adaptable Manufacturing Techniques | yes | (100)    | no    | (0)      | no     | (0)      | yes      | (100)    | no       | (0)      |
| Potential to Improve Delivery Methods     | yes  | (100)    | no    | (0)      | yes    | (100)    | yes      | (100)    | no       | (0)      |
| Impact on Public Education                | fav  | (100)    | fav   | (100)    | fav    | (100)    | fav      | (100)    | ad       | (0)      |
Transparent Results

SMART Vaccines

Specify: • Population • Disease • Vaccine
Evaluate: • Attributes • Weights • Priorities

Output

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Weight</th>
<th>Pneumo vaccine</th>
<th>Value</th>
<th>Score</th>
<th>HPV vaccine</th>
<th>Value</th>
<th>Score</th>
<th>Rota vaccine</th>
<th>Value</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incident Cases Prevented per Year</td>
<td>15%</td>
<td>6562</td>
<td>0</td>
<td>2140</td>
<td>0</td>
<td>222928</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality adjusted life-years (QALYs) Gained</td>
<td>14%</td>
<td>7725</td>
<td>6</td>
<td>13418</td>
<td>13</td>
<td>2965</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost-Effectiveness ($/QALY)</td>
<td>17%</td>
<td>-1030</td>
<td>101</td>
<td>-3264</td>
<td>103</td>
<td>54194</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrates New Production Platforms</td>
<td>2%</td>
<td>yes</td>
<td>100</td>
<td>yes</td>
<td>100</td>
<td>yes</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing or Adaptable Manufacturing Techniques</td>
<td>17%</td>
<td>yes</td>
<td>100</td>
<td>no</td>
<td>0</td>
<td>no</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential to Improve Delivery Methods</td>
<td>30%</td>
<td>yes</td>
<td>100</td>
<td>no</td>
<td>0</td>
<td>yes</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact on Public Education</td>
<td>5%</td>
<td>favora...</td>
<td>100</td>
<td>favora...</td>
<td>100</td>
<td>favora...</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Input

<table>
<thead>
<tr>
<th>Vaccine Characteristics</th>
<th>Pneumo vaccine</th>
<th>HPV vaccine</th>
<th>Rota vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coverage</td>
<td>35%</td>
<td>33%</td>
<td>57%</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>41%</td>
<td>90%</td>
<td>74%</td>
</tr>
<tr>
<td>Length of Immunity (years)</td>
<td>Life</td>
<td>Life</td>
<td>Life</td>
</tr>
<tr>
<td>Doses Required per Person (number)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Cost per Dose ($)</td>
<td>$10</td>
<td>$10</td>
<td>$8</td>
</tr>
<tr>
<td>Cost to Administer per Dose ($)</td>
<td>$10</td>
<td>$10</td>
<td>$10</td>
</tr>
<tr>
<td>R&amp;D and Licensure Costs ($ Millions)</td>
<td>&lt; $100</td>
<td>&gt; $1 billion</td>
<td>&lt; $100</td>
</tr>
<tr>
<td>Likelihood of Licensure within 10 Years (%)</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Product Profile
Design Using SMART Vaccines 1.1
Characteristics of PS23

SMART Vaccines

Specify:
- Population
- Disease
- Vaccine

Evaluate:
- Attributes
- Weights
- Priorities

Specify vaccine characteristics.

Population: SouthAfrica

Select Disease: Pneumo

Vaccine Name: PS23

Subpopulation: female

Product Profile:

<table>
<thead>
<tr>
<th>Age Groups (years)</th>
<th>Population (n)</th>
<th>Target</th>
<th>Coverage (percentage)</th>
<th>Effectiveness (percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants &lt; 1</td>
<td>504351</td>
<td></td>
<td>--</td>
<td>0</td>
</tr>
<tr>
<td>Children 1 to &lt; 20</td>
<td>9593485</td>
<td>✔</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>Adults 20 to &lt; 65</td>
<td>13928527</td>
<td>✔</td>
<td>75</td>
<td>70</td>
</tr>
<tr>
<td>Elderly &gt;= 65</td>
<td>1377384</td>
<td>✔</td>
<td>65</td>
<td>55</td>
</tr>
</tbody>
</table>

Vaccine Characteristic

<table>
<thead>
<tr>
<th>Vaccine Characteristic</th>
<th>Value</th>
<th>or lifetime immunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Immunity (years)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Doses Required per Person (number)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cost per Dose ($)</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Cost to Administer per Dose ($)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>R&amp;D and Licensure Costs ($)</td>
<td>$500 million - $1 billion</td>
<td></td>
</tr>
</tbody>
</table>
Characteristics of PS30

SMART Vaccines

Specify vaccine characteristics.

Population: SouthAfrica

Select Disease: Pneumo

Vaccine Name: PS30

Subpopulation: female

Product Profile:

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Population (n)</th>
<th>Target</th>
<th>Coverage (percentage)</th>
<th>Effectiveness (percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants &lt; 1</td>
<td>504851</td>
<td></td>
<td>--</td>
<td>0</td>
</tr>
<tr>
<td>Children 1 to &lt; 20</td>
<td>9593485</td>
<td>✓</td>
<td>65</td>
<td>85</td>
</tr>
<tr>
<td>Adults 20 to &lt; 65</td>
<td>13928527</td>
<td>✓</td>
<td>75</td>
<td>80</td>
</tr>
<tr>
<td>Elderly &gt;= 65</td>
<td>1377384</td>
<td>✓</td>
<td>65</td>
<td>70</td>
</tr>
</tbody>
</table>

Vaccine Characteristic | Value
--- | ---
Length of Immunity (years) | 10
Doses Required per Person (number) | 1
Cost per Dose ($) | 40
Cost to Administer per Dose ($) | 20
R&D and Licensure Costs ($) | > $1 billion

or herd immunity

or lifetime immunity

Save
Delete
Continue
Attributes and Weights

**SMART Vaccines**

Specify: Population Origin Disease Vaccine Evaluate: Attributes Weights Priorities

Rank attributes in order of importance (1 = MOST IMPORTANT) and fine tune weights.

<table>
<thead>
<tr>
<th>Attributes Selected</th>
<th>Least Favorable</th>
<th>Most Favorable</th>
<th>Rank</th>
<th>Modify</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premature Deaths Averted per Year</td>
<td>0</td>
<td>5000</td>
<td>3</td>
<td></td>
<td>15%</td>
</tr>
<tr>
<td>Quality adjusted life-years (QALYs) Gained</td>
<td>0</td>
<td>100000</td>
<td>1</td>
<td></td>
<td>52%</td>
</tr>
<tr>
<td>Net Direct Costs (Savings) of Vaccine Use per Year (Millions)</td>
<td>50</td>
<td>0</td>
<td>4</td>
<td></td>
<td>6%</td>
</tr>
<tr>
<td>Cost-Effectiveness ($/QALY)</td>
<td>10000</td>
<td>0</td>
<td>2</td>
<td></td>
<td>27%</td>
</tr>
</tbody>
</table>

![Relative Weight of Attribute Differences Graph](image)
## Initial SMART Scores

### SMART Vaccines

Select vaccine candidates to compare. Set attributes and scores. View SMART Score calculated for total population.

**NOTE:** Orange highlighted scores have been altered in Analysis; Vaccine Profile.

<table>
<thead>
<tr>
<th>Attributes Selected</th>
<th><strong>SouthAfrica Vaccine Candidates: Values (Scores)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pneumo</td>
</tr>
<tr>
<td>Premature Deaths Averted per Year</td>
<td>1265 (25)</td>
</tr>
<tr>
<td>Quality adjusted life-years (QALYs) Gained</td>
<td>16702 (17)</td>
</tr>
<tr>
<td>Net Direct Costs (Savings) of Vaccine Use per Year (Millions)</td>
<td>20 (60)</td>
</tr>
<tr>
<td>Cost-Effectiveness ($/QALY)</td>
<td>4417 (66)</td>
</tr>
</tbody>
</table>

### SMART Score

- **Legend**
  - Health
  - Public Intangible
  - Economic
  - Science/Business
  - Demographic
  - Programmatic
  - User-Defined

- **NOTE:** Hatched bars contain negative scores.

![SMART Score Chart](chart.png)

**Analysis**
- Assessment
- Weights
- Vaccine Profile
- Print
Coverage Adjustment

SMART Vaccines

Examine vaccine profile effects on attributes and SMART Score.

**SouthAfrica Vaccine**

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>PneumoPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood of Licensure within 10 Years</td>
<td>0% ⬤ 100% 100%</td>
</tr>
<tr>
<td>Coverage (%)</td>
<td>0% ⬤ 100% 80%</td>
</tr>
<tr>
<td>Effectiveness (%)</td>
<td>0% ⬤ 100% 77%</td>
</tr>
<tr>
<td>Length of Immunity (Years)</td>
<td>1Yr ⬤ Life 10Yrs</td>
</tr>
<tr>
<td>Doses per Person</td>
<td>1 ⬤ 5 3</td>
</tr>
<tr>
<td>Cost per Dose</td>
<td>$1 ⬤ $1,000 $30</td>
</tr>
<tr>
<td>Cost to Administer per Dose</td>
<td>$1 ⬤ $1,000 $20</td>
</tr>
<tr>
<td>R&amp;D and Licensure Costs ($100 Millions)</td>
<td>&lt;$1 ⬤ $10 $5-10</td>
</tr>
</tbody>
</table>

**Attributes**

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Values (Scores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premature Deaths Averted per Year</td>
<td>1645 (33)</td>
</tr>
<tr>
<td>Quality adjusted life-years (QALYs) Gained</td>
<td>21805 (22)</td>
</tr>
<tr>
<td>Net Direct Costs (Savings) of Vaccine Use per Year (Millions)</td>
<td>230 (-361)</td>
</tr>
<tr>
<td>Cost-Effectiveness ($/QALY)</td>
<td>18412 (-84)</td>
</tr>
</tbody>
</table>

**SMART Score**

NOTE: Hatched bars contain negative scores.

**Update**

Vaccine updated
Coverage and effectiveness changes uniformly redistributed to vaccine target population sub-groups.

**Analysis**

- Assessment
- Weights
- Vaccine Profile
- Print

**Institute of Medicine**

**National Academy of Engineering**

**The National Academies**
Advisers to the Nation on Science, Engineering, and Medicine
Examine vaccine profile effects on attributes and SMART Score.

**SouthAfrica Vaccine**

**Vaccine**
- PneumoPC

**Likelihood of Licensure within 10 Years**
- 0% 
- 100%
- 100%

**Coverage (%)**
- 0% 
- 100%
- 71%

**Effectiveness (%)**
- 0% 
- 100%
- 80%

**Length of Immunity (Years)**
- 1Yr 
- Life
- 10Yrs

**Doses per Person**
- 1 
- 5
- 3

**Cost per Dose**
- $1 
- $1,000
- $30

**Cost to Administer per Dose**
- $1 
- $1,000
- $20

**R&D and Licensure Costs ($100 Millions)**
- <$1 
- >$10
- $5-10

**Attributes**
- Premature Deaths Averted per Year
- Quality adjusted life-years (QALYs) Gained
- Net Direct Costs (Savings) of Vaccine Use per Year (Millions)
- Cost-Effectiveness ($/QALY)

**Values (Scores)**
- 1502
- (30)
- 19902
- (20)
- 202
- (-305)
- 17552
- (-77)

**Legend**
- Health
- Public
- Economic
- Intangible
- Demographic
- Programmatic
- User-Defined

**SMART Score**

**Analysis**
- Assessment
- Weights
- Vaccine Profile
- Print
## Immunity Adjustment

### SMART Vaccines

Examine vaccine profile effects on attributes and SMART Score.

#### SouthAfrica Vaccine

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood of Licensure within 10 Years</td>
<td>0% - 100%</td>
</tr>
<tr>
<td>Coverage (%)</td>
<td>0% - 100%</td>
</tr>
<tr>
<td>Effectiveness (%)</td>
<td>0% - 100%</td>
</tr>
<tr>
<td>Length of Immunity (Years)</td>
<td>1Yr - Life - 15Yrs</td>
</tr>
<tr>
<td>Doses per Person</td>
<td>1 - 5</td>
</tr>
<tr>
<td>Cost per Dose</td>
<td>$1 - $1,000</td>
</tr>
<tr>
<td>Cost to Administer per Dose</td>
<td>$1 - $1,000</td>
</tr>
<tr>
<td>R&amp;D and Licensure Costs ($100 Millions)</td>
<td>&lt;$1 - &gt;$10</td>
</tr>
</tbody>
</table>

#### Attributes and Values (Scores)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Values (Scores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premature Deaths Averted per Year</td>
<td>1460 (29)</td>
</tr>
<tr>
<td>Quality adjusted life-years (QALYs) Gained</td>
<td>19354 (19)</td>
</tr>
<tr>
<td>Net Direct Costs (Savings) of Vaccine Use per Year (Millions)</td>
<td>113 (-125)</td>
</tr>
<tr>
<td>Cost-Effectiveness ($/QALY)</td>
<td>11142 (-11)</td>
</tr>
</tbody>
</table>

### SMART Score

Legend:
- Health
- Public
- Intangible
- Economic
- Sci/Business
- Demographic
- Programmatic
- User-Defined

NOTE: Hatched bars contain negative scores.

Analysis:
- Assessment
- Weights
- Vaccine Profile
- Print

Update: Vaccine updated
Product Profile Change

SMART Vaccines

Examine vaccine profile effects on attributes and SMART Score.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>SouthAfrica Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood of Licensure within 10 Years</td>
<td>0%</td>
</tr>
<tr>
<td>Coverage (%)</td>
<td>0%</td>
</tr>
<tr>
<td>Effectiveness (%)</td>
<td>0%</td>
</tr>
<tr>
<td>Length of Immunity (Years)</td>
<td>1Yr</td>
</tr>
<tr>
<td>Doses per Person</td>
<td>1</td>
</tr>
<tr>
<td>Cost per Dose</td>
<td>$1</td>
</tr>
<tr>
<td>Cost to Administer per Dose</td>
<td>$1</td>
</tr>
<tr>
<td>R&amp;D and Licensure Costs ($100 Millions)</td>
<td>&lt;$1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Values (Scores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premature Deaths Averted per Year</td>
<td>1693 (34)</td>
</tr>
<tr>
<td>Quality adjusted life-years (QALYs) Gained</td>
<td>22423 (22)</td>
</tr>
<tr>
<td>Net Direct Costs (Savings) of Vaccine Use per Year (Millions)</td>
<td>28 (44)</td>
</tr>
<tr>
<td>Cost-Effectiveness ($/QALY)</td>
<td>4050 (60)</td>
</tr>
</tbody>
</table>

SMART Score

Analysis
- Assessment
- Weights
- Vaccine Profile
- Print

Institute of Medicine
National Academy of Engineering
The National Academies
Advisers to the Nation on Science, Engineering, and Medicine
Beyond Cost-Effectiveness

**SMART Vaccines**

Specify:
- Population

Evaluate:
- Attributes
- Disease
- Weights
- Vaccine
- Priorities

Select vaccine candidates to compare. Set attributes and scores. View SMART Score calculated for total population.

NOTE: Orange highlighted scores have been altered in Analysis; Vaccine Profile.

### United States Vaccine Candidates: Values (Scores)

<table>
<thead>
<tr>
<th>Attributes Selected</th>
<th>Flu vaccine1</th>
<th>Rota vaccine</th>
<th>Pneumo vaccine</th>
<th>HPV vaccine1</th>
<th>Ebola vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost-Effectiveness ($/QALY)</td>
<td>10836 (99)</td>
<td>54194 (93)</td>
<td>-1030 (100)</td>
<td>-3264 (100)</td>
<td>125799 (84)</td>
</tr>
<tr>
<td>Disease Raises Fear and Stigma in the Public</td>
<td>no (0)</td>
<td>no (0)</td>
<td>no (0)</td>
<td>no (0)</td>
<td>yes (100)</td>
</tr>
<tr>
<td>Serious Pandemic Potential</td>
<td>yes (100)</td>
<td>no (0)</td>
<td>no (0)</td>
<td>no (0)</td>
<td>yes (100)</td>
</tr>
<tr>
<td>Eradication or Elimination of the Disease</td>
<td>no (0)</td>
<td>no (0)</td>
<td>no (0)</td>
<td>no (0)</td>
<td>yes (100)</td>
</tr>
</tbody>
</table>

### SMART Score

Legend:
- Health
- Public
- Economic
- Intangible
- Demographic
- Programmatic
- User-Defined

![SMART Score Diagram](chart.png)

Analysis
- Assessment
- Weights
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Demonstrated Benefits of SMART Vaccines

1. Transparency.
2. Discussion Facilitation.
3. Decision Convergence.
Guiding Principle

SMART Vaccines will have the greatest potential and value if it is programmed as a dynamic, continuously evolving software application and made freely available in an open-source environment to all decision makers and developers around the world.

The committee places a strong emphasis on the importance of additional outreach and communication efforts to achieve the best use of SMART Vaccines.
IOM Dissemination Efforts

Logo sources: Google images
A transition strategy to a permanent home for SMART Vaccines is necessary for the ongoing use, enhancement, and the survival of the software as a tool for strategic planning.
Transition Process

The National Vaccine Program Office and the Fogarty International Center of the National Institutes of Health will be best served if they promptly create a process to facilitate the transition of SMART Vaccines to a permanent home.
The ultimate future applications and benefits of SMART Vaccines depend on the strengths of the organization or consortium that becomes the permanent host.
The committee believes not only that the best hosting organization will have a significant international presence and reputation, but also will best serve the user community if it is—or partners with—a research-intensive institution of higher education.
Community Development

The committee urges that a community of users, developers, and decision makers be created, fostered, and supported (most likely by the host of SMART Vaccines) to facilitate further use of the tool, data development and curation, and to guide additional software improvements and enhancements.
Data Requirements

The data requirements that may seem to loom large in the eyes of potential users are not created by the software itself—it merely brings them to the forefront. One cannot make intelligent, data-informed decisions about vaccine priorities without these data.
The committee believes that a fully Web-based version is an essential next step in the development of SMART Vaccines.
Critical R&D Priorities

1. Software enhancements.
2. Integrated database system development.
3. Community of users, developers, and decision makers.
4. Group consensus process.
As a multi-stakeholder decision support system, the software has the potential to change the practices of many parties in the vaccine enterprise—suppliers, users, and supporters of vaccine deployment, both domestically and internationally.
A Sense of Urgency

The economic challenges and profound changes seen in today’s health care system should create a sense of urgency to improve disease prevention strategies using tools such as SMART Vaccines.
| **Health Considerations** | • Premature Deaths Averted per Year  
• Incident Cases Prevented per Year  
• QALYs Gained or DALYs Averted |
| **Economic Considerations** | • Net Direct Costs (Savings) of Vaccine Use per Year  
• Workforce Productivity Gained per Year  
• One-Time Costs  
• Cost-Effectiveness ($/QALY or $/DALY) |
| **Demographic Considerations** | • Benefits Infants and Children  
• Benefits Women  
• Benefits Socioeconomically Disadvantaged  
• Benefits Military Personnel  
• Benefits Other Priority Population |
| **Public concerns** | • Availability of Alternative Public Health Measures  
• Potential Complications Due to Vaccines  
• Disease Raises Fear and Stigma in the Public  
• Serious Pandemic Potential |
| **Scientific and Business Considerations** | • Likelihood of Financial Profitability for the Manufacturer  
• Demonstrates New Production Platforms  
• Existing or Adaptable Manufacturing Techniques  
• Potential Litigation Barriers Beyond Usual  
• Interests from NGOs and Philanthropic Organizations |
| **Programmatic Considerations** | • Potential to Improve Delivery Methods  
• Fits into Existing Immunization Schedules  
• Reduces Challenges Relating to Cold-Chain Requirements |
| **Intangible Values** | • Eradication or Elimination of the Disease  
• Vaccine Raises Public Health Awareness |
| **Policy Considerations** | • Interest for National Security, Preparedness, and Response  
• Advances Nation's Foreign Policy Goals |
| **User-Defined Attributes** | • Up to Seven Attributes |