Software for National-Level Vaccine Cold Chain Equipment Management

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The Vaccine Cold Chain
With support from the Global Alliance for Vaccines and Immunizations, pneumococcal and rotavirus vaccines will be introduced in over 40 countries in the next 5 years, potentially preventing 650,000 deaths from pneumonia and 450,000 deaths from diarrhea each year. It is essential that national immunization programs (NIPs) plan and manage the refrigeration equipment needed to ensure that these life-saving vaccines are kept at safe temperatures in a continuous “cold chain” from manufacturer to child.

Cold Chain Equipment Manager (CCEM)
CCEM is a Microsoft Access-based cold chain inventory and planning tool developed by PATH with support from USAID, WHO, and UNICEF. Report generation, geographic visualization, and system modeling by the software adhere to national immunization policies and WHO/UNICEF cold chain planning algorithms and reference data.

Cold Chain Planning and Inventory Tool
Software for managing facility and equipment inventory data, with analytic functions that NIPs can use to generate reports, map information, and run simple planning scenarios to support optimized equipment procurement lists and budgets.

Analytic Tools
Storage capacity compared with vaccine requirements
Performance Reports
Summaries of equipment type, age, distribution and costs
Management Support
Status of facilities and individual pieces of equipment

Optimized cold chain planning is possible with access to up-to-date data on equipment types, ages, working status, and storage capacity. This project demonstrates the role of software and analytic tools to support evidence-based planning of the vaccine cold chain.

Cold Chain Equipment Manager (continued)
Results from the four implementation countries demonstrate the importance of inventory-based analysis of the capacity and quality of the cold chain at the national, district, and facility levels. For each country, areas of the cold chain that need investment to accommodate the introduction of new equipment required to meet capacity shortages.

Equipment needs and costs to address cold chain equipment deficiencies in four countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Ice-lined refrigerator units</th>
<th>Gas/Kerosene units</th>
<th>Cold rooms</th>
<th>Cost USD in 000s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country A</td>
<td>219</td>
<td>258</td>
<td>0</td>
<td>745</td>
</tr>
<tr>
<td>Country B</td>
<td>47</td>
<td>56</td>
<td>4</td>
<td>242</td>
</tr>
<tr>
<td>Country C</td>
<td>94</td>
<td>413</td>
<td>13</td>
<td>1,604</td>
</tr>
<tr>
<td>Country D</td>
<td>55</td>
<td>35</td>
<td>0</td>
<td>97</td>
</tr>
</tbody>
</table>

Notes
1. Equipment assignment to meet all shortages at government health facilities and storage sites. A medium-sized presentation of rotavirus vaccine is assumed.
2. Equipment assignments follow country preferences. Inventory data from some countries is preliminary. There is a high variability in costs for cold rooms due to construction and site setup.
3. Country A3 analysis assumes three-month supply intervals to district vaccine stores.
4. Country B has cold rooms on order or waiting installation. A quantity of new refrigeration equipment is available for allocation and not reflected in the analysis.
5. Country C has 11 regional vaccines stores in the planning phase. The inventory did not account for new equipment on hand awaiting allocation.
6. Country D’s analysis does not consider replacement of out-of-date equipment.
The cost per annual birth of required equipment for introduction of Pneumococcal and Rotavirus vaccines (Total cost / annual births) is $1.32 for Country A, $0.87 for Country B, $2.11 for Country C, and $1.40 for Country D.

Software Adoption
The key lesson from the introduction of CCEM was that it addressed the needs of two separate groups of stakeholders: planners and managers. The planners at the national and global level are interested in the tool to answer system-wide questions, while the managers focus on individual facilities and updates to the inventory. The introduction of CCEM depends upon support from the planners, while sustained use and inventory updates depend upon the managers.