Mitigating the Risk of FP Commodity Stock-outs

Empirical evidence from Indonesia

Co Authors:
Amir Karimi, Karthik Natarajan, and Kingshuk Sinha
Supply Chain and Operations Department, Carlson School of Management, University of Minnesota

Omar Balsara, Sarah Andersson, and Bethany Saad
JSI Research and Training Institute, Inc.

Presenter:
Barbara Knittel
JSI Research & Training Institute, Inc.
RIGHT TIME, RIGHT METHOD, MY CHOICE

Social Media creates buzz and promotes social norm around support for family choices for contraceptives.

Mass Media promote the Smartphone App and to promote FP through lifestyle and life stage choice lens.

Provider Apps promotes Post Partum Family Planning in the designated facilities.

Consumer Apps provides information on FP, self counselling, calendars for FP method specific reminder and child immunization as well as life planning simulation.

Advocacy Materials will be developed as part as evidence based advocacy activities to leverage support and resources.

Motivator's Tab provides the main FP promotional and counselling materials in multimedia form.

LARC & PPPP supplies

ABPK
Motivators, Cadres & PLKB
FP Champions & Advocates

FP, LARC & PPPP SUPPLIES

FP, LARC & PPPP SUPPLIES
PROJECT REGIONS

Proof of Concept
11 Districts

Scale up
24 New Districts
A strong and dynamic supply chain system that enables all people to have consistent access to a full range of contraceptive methods.
BASELINE ASSESSMENT – ASSESSING RISK FACTORS

Inventory Management
Use of service targets to make resupply decisions and an inadequate inventory control system resulting in stock imbalances.

Logistics Management Information Systems
BKKBN has a robust electronic LMIS, but poor records management at SDPs compromises quality and limits use of the data.

Communication and Collaboration
Supply chain functions cut across multiple divisions and levels with minimal communication and coordination resulting in inefficiencies within the supply chain.

Organizational Capacity
The FP program lacked standardized processes and a mechanism for routine monitoring and supervision of the supply chain. High staff turnover made capacity building challenging.
**PROJECT INTERVENTIONS**

**Inventory Management**

**Solution:** Design and implement a dynamic consumption-based inventory control system using fixed distribution schedules and standardized trigger points that facilitate emergency supplies or reallocations, making the system more adaptable to changes in demand.

**Logistics Recording and Reporting**

**Solution:** Build capacity of warehouse and SDP staff by equipping them with job aids and video tutorials that aim to improve accuracy of records and reports.

**Quality Improvement Teams**

**Solution:** Institute a Quality Improvement Team (QIT) model: a mechanism that fosters multi-division/level collaboration and inculcates a culture of data use for supply chain performance monitoring and improvement.

**Mentorship and On-the-Job Training**

**Solution:** Introduce a mentorship and on-the-job training program to build capacity of SDPs through coaching and feedback. Mentors also use a monitoring checklist that provides an additional dimension of data that can be used for decision making.
ARE WE MAKING AN IMPACT?
EVALUATION RESULTS
EVALUATION METHODOLOGY: DATA COLLECTION

Baseline/Endline Quantitative Surveys

*Data collection methods*

- Interviews
- Physical count
- Review of records and reports
- Observations of storage conditions

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Baseline</th>
<th>Endline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Health Care (Puskesmas)</td>
<td>217</td>
<td>231</td>
</tr>
<tr>
<td>Private Facilities</td>
<td>91</td>
<td>84</td>
</tr>
<tr>
<td>Public/ Private Warehouses</td>
<td>33</td>
<td>43</td>
</tr>
<tr>
<td>District Warehouses</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Provincial Warehouses</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>356</strong></td>
<td><strong>373</strong></td>
</tr>
</tbody>
</table>

Qualitative Group Discussions

*Qualitative workshops* with Province and District Stakeholders

- Data validation, identify strengths and challenges, sustainability

Routine Data Analysis

*Review monthly reports*

- Warehouse and health facility monthly eLMIS reports
- Mentorship visit reports
- Comparison of eLMIS data from project districts with non-intervention districts
**IMPROVED PRODUCT AVAILABILITY AT SDPs**

**47%**

**DECREASE in number of SDPs STOCKED OUT**

**37%**

**INCREASE in number of SDPs ADEQUATELY STOCKED**

Source: My Choice Baseline and Endline Surveys
STOCK IMBALANCES DECREASED

15% fewer SDPs stocked out
21% more SDPs with adequate stock

Average Stock Status at SDPs for all methods

Rest of Country

<table>
<thead>
<tr>
<th>Year</th>
<th>Stock out</th>
<th>Under stock (&lt;0.5 months)</th>
<th>Adequate stock (0.5 to 5 months)</th>
<th>Over stock (&gt;5 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>28%</td>
<td>7%</td>
<td>28%</td>
<td>7%</td>
</tr>
<tr>
<td>2017</td>
<td>27%</td>
<td>7%</td>
<td>28%</td>
<td>6%</td>
</tr>
</tbody>
</table>

My Choice Districts

<table>
<thead>
<tr>
<th>Year</th>
<th>Stock out</th>
<th>Under stock (&lt;0.5 months)</th>
<th>Adequate stock (0.5 to 5 months)</th>
<th>Over stock (&gt;5 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>26%</td>
<td>6%</td>
<td>28%</td>
<td>6%</td>
</tr>
<tr>
<td>2017</td>
<td>23%</td>
<td>5%</td>
<td>35%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: BKKBN eLMIS data – average of Monthly Reports
DISTRIBUTION SCHEDULE REDUCED STOCK OUTS

Bi-monthly Distribution

Delivery frequency and stock out rates

Source: My Choice Endline Survey
STOCK IMBALANCES DECREASED

235% increase in number of SDPs using stock cards

89% increase in number of accurate stock cards*

*matching physical stock

Stock card usage and accuracy at SDPs

<table>
<thead>
<tr>
<th></th>
<th>Baseline (n=341)</th>
<th>Endline (n=358)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of SDPs using stock cards</td>
<td>24%</td>
<td>80%</td>
</tr>
<tr>
<td>% of accurate stock cards (matching physical stock)</td>
<td>34%</td>
<td>64%</td>
</tr>
</tbody>
</table>

Source: My Choice Baseline and Endline Surveys
IMPROVED RECORDKEEPING REDUCED STOCK OUTS

![Accurate Records + Accurate Reports = Informed Resupply](image)

**Logistics record use and stockout rates**

- **Pill**: 3% SDPs with stock cards, 10% SDPs without stock cards
- **IUD**: 5% SDPs with stock cards, 10% SDPs without stock cards
- **Injectable**: 2% SDPs with stock cards, 7% SDPs without stock cards
- **Implant**: 16% SDPs with stock cards, 42% SDPs without stock cards
- **Condom**: 10% SDPs with stock cards, 44% SDPs without stock cards

**Logistics record accuracy and stockout rates**

- **Pill**: 2% SDPs with accurate stock cards, 3% SDPs without accurate stock cards
- **IUD**: 2% SDPs with accurate stock cards, 6% SDPs without accurate stock cards
- **Injectable**: 2% SDPs with accurate stock cards, 4% SDPs without accurate stock cards
- **Implant**: 16% SDPs with accurate stock cards, 21% SDPs without accurate stock cards
- **Condom**: 9% SDPs with accurate stock cards, 18% SDPs without accurate stock cards

*Source: My Choice Endline Survey*
“The mentorship and on-the-job training program...inform facilities about the importance of maintaining accurate records. Now health facilities are consistently conducting physical stock counts at the end of each month.”

—HEAD OF FP PROGRAM & FINANCE DIVISION, BREBES DISTRICT, CENTRAL JAVA

Impact of routine mentor visits on SDP logistics records and reporting

Source: Mentorship Program Data
We examined the effects of key program interventions on stock card usage, stock card accuracy, and stock outs, defined as stock out today and stock out in the last 3 months, using logistic regression models. All models were run in Stata 15, using pre- and post-intervention survey data and/or routine supportive supervision data collected by the program via Magpi, a mobile data platform.
DETAILS OF MODELS

Logistic Regression Model 1: Drivers of Stock Card Usage

\[ Pr(Stock Card Usage_{ij} = 1 \mid X) = \beta_0 + \beta_{Control} X_{Control} + \beta_1 \text{Logistics Reporting & Recording (LRR)}_j + \epsilon_{ij} \] (a)

\[ Pr(Stock Card Usage_{ij} = 1 \mid X) = \beta_0 + \beta_{Control} X_{Control} + \beta_2 \text{Mentorship & Job Training (MOT)}_j + \epsilon_{ij} \] (b)

Logistic Regression Model 2: Drivers of Stock Card Accuracy

\[ Pr(Stock Card Accuracy_{ij} = 1 \mid X) = \beta_0 + \beta_{Control} X_{Control} + \beta_1 \text{Logistics Reporting & Recording (LRR)}_j + \epsilon_{ij} \] (a)

\[ Pr(Stock Card Accuracy_{ij} = 1 \mid X) = \beta_0 + \beta_{Control} X_{Control} + \beta_2 \text{Mentorship & Job Training (MOT)}_j + \epsilon_{ij} \] (b)
DETAILS OF MODELS

Logistic Regression Model 3: Drivers of Stock-out Today

\[
Pr(Out \text{--} of \text{--} Stock \text{ Today}_{ij} = 1 \mid X) \\
= \beta_0 + \beta_{Control} X_{Control} + \beta_1 \text{Inventory Management (IM)}_j \\
+ \beta_2 \text{Stock Card Usage}_{ij} + \epsilon_{ij}
\] (a)

\[
Pr(Out \text{--} of \text{--} Stock \text{ Today}_{ij} = 1 \mid X) \\
= \beta_0 + \beta_{Control} X_{Control} + \beta_3 \text{Stock Card Accuracy}_{ij} + \epsilon_{ij}
\] (b)

Logistic Regression Model 4: Drivers of Stock-out Last 3 Months

\[
Pr(Out \text{--} of \text{--} Stock \text{ Last 3 Months}_{ij} = 1 \mid X) \\
= \beta_0 + \beta_{Control} X_{Control} + \beta_1 \text{Inventory Management (IM)}_j \\
+ \beta_2 \text{Stock Card Usage}_{ij} + \epsilon_{ij}
\] (a)

\[
Pr(Out \text{--} of \text{--} Stock \text{ Last 3 Months}_{ij} = 1 \mid X) \\
= \beta_0 + \beta_{Control} X_{Control} + \beta_3 \text{Stock Card Accuracy}_{ij} + \epsilon_{ij}
\] (b)
UNIT OF ANALYSIS AND CONTROL VARIABLES

• Unit of Analysis across all models: facility-method, i.e., a contraceptive commodity offered at a facility

• Standard errors clustered at the facility-level to account for potential correlation of observations within facilities

Control Variables:

• Primary facility: takes value of 1 when facilities are either ‘Pukesmas’ or ‘Private Clinic’, and 0 otherwise

• Protective measures: measured on a scale of 0-7

• Contraceptive Method Fixed Effects

• District Type Fixed Effects

• Year/ Month Fixed Effects: corresponding to when the survey was conducted
LRR and MOT have a positive effect on facility level stock card usage. When LRR and/or MOT are conducted, stock card usage increases. Similarly, MOT has a positive effect on stock card accuracy; when MOT is conducted accuracy improves.

**Model 1**

<table>
<thead>
<tr>
<th>DV: Stock Card Usage</th>
<th>Model 1</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Logistics Reporting &amp; Recording (LRR)</td>
<td>1.26***</td>
<td>LRR</td>
<td>(0.35)</td>
</tr>
<tr>
<td>Mentorship &amp; On-the-Job Training (MOT)</td>
<td>1.10***</td>
<td>MOT</td>
<td>(0.29)</td>
</tr>
<tr>
<td>Constant</td>
<td>2.91***</td>
<td>-2.45**</td>
<td></td>
</tr>
</tbody>
</table>

**Model 2**

<table>
<thead>
<tr>
<th>DV: Stock Card Accuracy</th>
<th>Model 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Logistics Reporting &amp; Recording (LRR)</td>
<td>-0.01</td>
<td>LRR</td>
<td>(0.18)</td>
</tr>
<tr>
<td>Mentorship &amp; On-the-Job Training (MOT)</td>
<td>0.30*</td>
<td>MOT</td>
<td>(0.17)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.91</td>
<td>-3.41***</td>
<td></td>
</tr>
</tbody>
</table>

*** p<0.01, ** p<0.05, * p<0.1

Note. Robust standard errors clustered at the facility level in parentheses. Model (a) is based on survey data, while model (b) is based on Magpi data.
Stock card usage and stock card accuracy have a positive effect on stock out rates, meaning stock out rates decrease as usage and/or accuracy increase. Inventory management, specifically distribution schedule, had no significant effect on stock out rates in this model.

---

### Model 3

<table>
<thead>
<tr>
<th>DV: Out-of-Stock Today</th>
<th>(a) Stock Card Users and Non-Users</th>
<th>(b) Stock Card Users Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td><strong>Inventory Management</strong></td>
<td>0.06 (0.16)</td>
<td>0.58 (0.56)</td>
</tr>
<tr>
<td><strong>Stock Card Usage</strong></td>
<td>-0.41** (0.21)</td>
<td>-0.32*** (0.02)</td>
</tr>
<tr>
<td><strong>Stock Card Accuracy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>0.58 (0.56)</td>
<td>1.41** (0.72)</td>
</tr>
<tr>
<td><strong>Pseudo R Squared</strong></td>
<td>0.16</td>
<td>0.33</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>3,214</td>
<td>1,828</td>
</tr>
</tbody>
</table>

*** p<0.01, ** p<0.05, * p<0.1  
Note. Robust standard errors clustered at the facility level in parentheses. Model (a) is based on survey data, while model (b) is based on Magpi data.
Stock outs in the last three months were positively affected by stock card accuracy, meaning the **stock out rates over the last three months were reduced** when stock card accuracy increased. While the presence of stock card usage and inventory management reduced stock outs, these results were not statistically significant.

Model 4

<table>
<thead>
<tr>
<th>DV: Out-of-Stock Last 3 Months</th>
<th>(a) Stock Card Users and Non-Users</th>
<th>(b) Stock Card Users Only</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inventory Management</strong></td>
<td>-0.13 (0.13)</td>
<td></td>
</tr>
<tr>
<td><strong>Stock Card Usage</strong></td>
<td>-0.26 (0.18)</td>
<td></td>
</tr>
<tr>
<td><strong>Stock Card Accuracy</strong></td>
<td>0.29*** (0.02)</td>
<td>-0.29*** (0.02)</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>0.65 (0.48)</td>
<td>1.48*** (0.54)</td>
</tr>
<tr>
<td><strong>Pseudo R Squared</strong></td>
<td>0.18</td>
<td>0.29</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>3,254</td>
<td>1,828</td>
</tr>
</tbody>
</table>

*** p<0.01, ** p<0.05, * p<0.1

Note. Robust standard errors clustered at the facility level in parentheses. Model (a) is based on survey data, while model (b) is based on Magpi data.
<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Mitigation</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock out (today)</td>
<td>Stock card usage (via exposure to LRR and MOT)</td>
<td>An increase in stock card usage leads to a <strong>34% decrease</strong> in the odds of stock outs across all methods</td>
</tr>
<tr>
<td></td>
<td>Stock card accuracy (via exposure to LRR and MOT)</td>
<td>An increase in stock card accuracy leads to a <strong>27% decrease</strong> in the odds of a stock out across all methods</td>
</tr>
<tr>
<td>Stock out (last 3 months)</td>
<td>Stock card accuracy (via exposure to LRR and MOT)</td>
<td>An increase in stock card accuracy leads to a <strong>29% decrease</strong> in the odds of a stock out across all methods</td>
</tr>
<tr>
<td>Risk factor</td>
<td>Mitigation</td>
<td>Impact</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Stock card usage</td>
<td>Exposure to comprehensive logistics recording and reporting practices, material and exercises</td>
<td>A 253% increase in the odds of stock card usage</td>
</tr>
<tr>
<td></td>
<td>Exposure to on-the-job mentorship and training program</td>
<td>A 200% increase in the odds of stock card usage</td>
</tr>
<tr>
<td>Stock card accuracy</td>
<td>Exposure to on-the-job mentorship and training program</td>
<td>An increase of 35% in stock card accuracy</td>
</tr>
</tbody>
</table>
Supply Chain Policy Improvements: Improving guidelines and SOPs, building on the successes and lessons learned from the implementation in the pilot regions

Quantification: Strengthening methodologies and tools to improve forecast accuracy and supply planning

Training Design: Curriculum development and building capacity of trainers

Supply Chain Digitization: Digitizing distribution planning and warehouse management practices through development of mobile and web-based applications

Performance Monitoring: Development of a supply chain dashboard to improve logistics data visibility and use
Stronger Supply Chains save lives