Mitigating the Risk of FP Commodity Stock-outs
Empirical evidence from Indonesia


Presenter:

Barbara Knittel

JSI Research & Training Institute, Inc.

Co Authors:

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

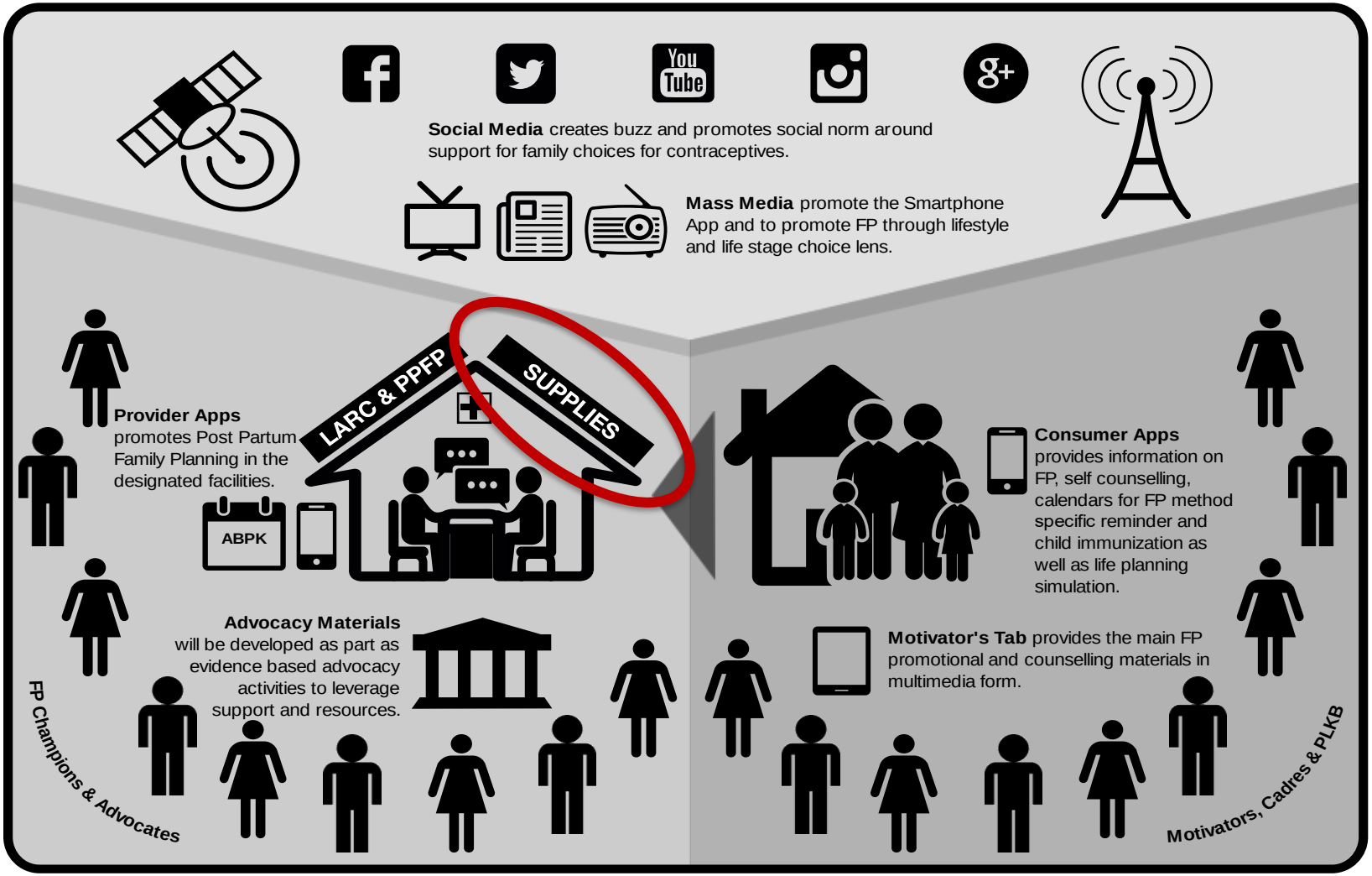
Omar Balsara, Sarah Andersson, and Bethany Saad
JSI Research and Training Institute, Inc.

PilihanKu

UNIVERSITY OF MINNESOTA

JSI

RIGHT TIME, RIGHT METHOD, MY CHOICE



PROJECT REGIONS

Proof of Concept
11 Districts

Scale up
24 New Districts

SUPPLY CHAIN IMPROVEMENT PROCESS

NOVEMBER 2015

Baseline assessment; identify bottlenecks and needs

Design system strengthening solutions

FEBRUARY 2016

APRIL 2016 – JANUARY 2018

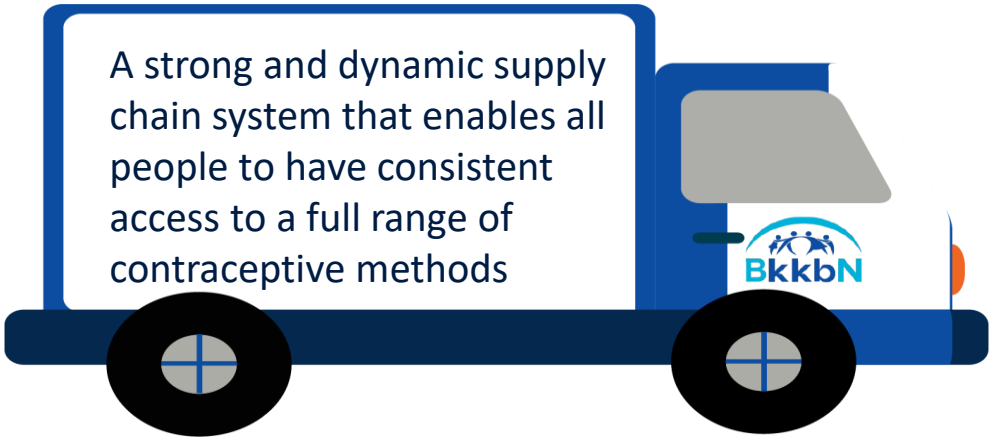
Implement, monitor and make course correction, as needed

Impact evaluation; identify successes for scale up

FEBRUARY 2018

JAN 2018 – AUG 2020

Scale up to other districts. Strengthen supply chain policies



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.

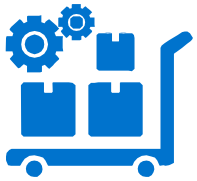
Communication and Collaboration

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

Facility Type	Baseline	Endline
Primary Health Care (Puskesmas)	217	231
Private Facilities	91	84
Public/ Private Warehouses	33	43
District Warehouses	11	11
Provincial Warehouses	4	4
Total	**356**	**373**

Qualitative Group Discussions

Qualitative workshops with Province and District Stakeholders

- Data validation, identify strengths and challenges, sustainability

Routine Data Analysis

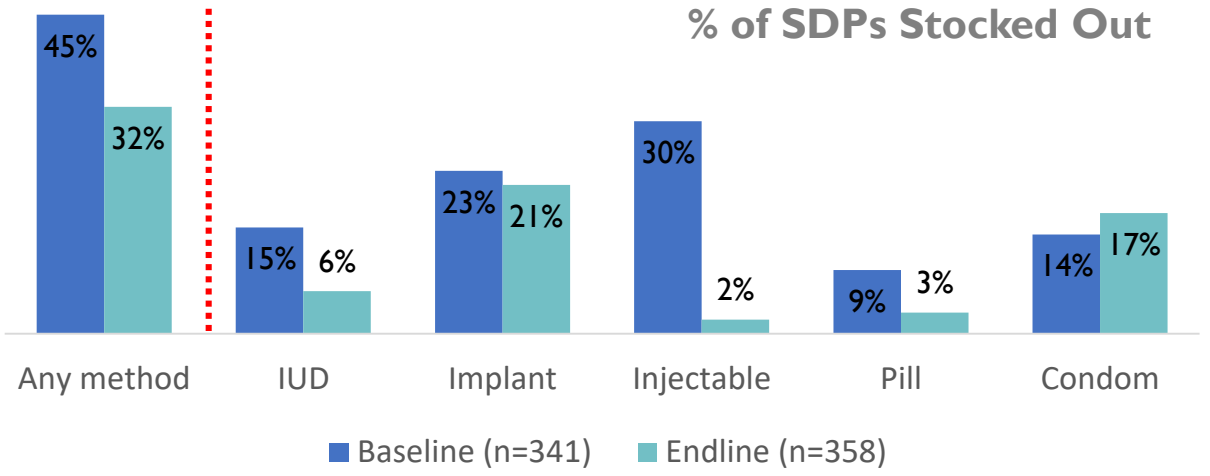
Review monthly reports

- 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

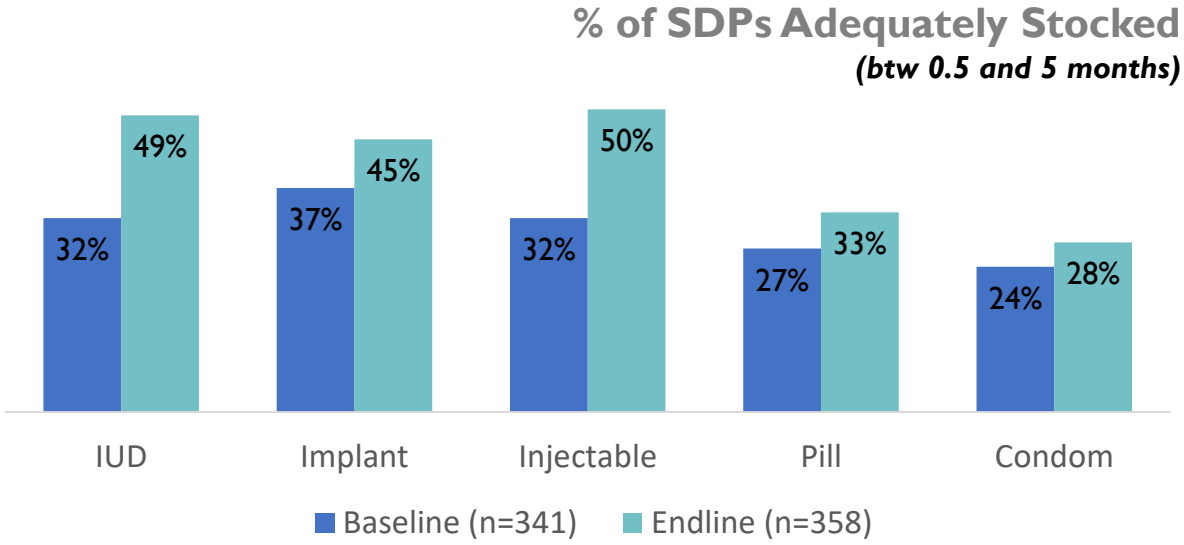
47%

DECREASE in number of SDPs STOCKED OUT*



37%

INCREASE in number of SDPs ADEQUATELY STOCKED*

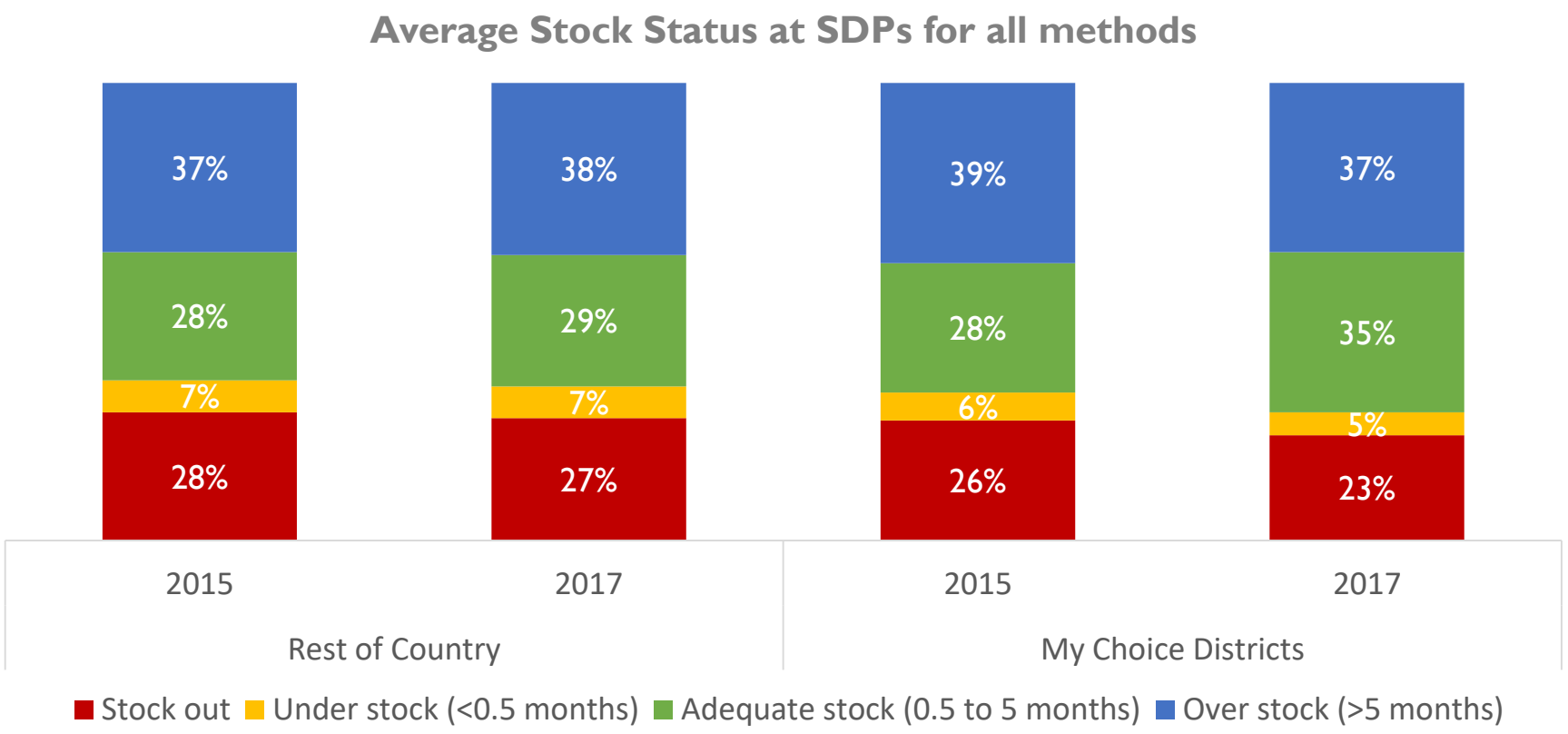


Source: My Choice Baseline and Endline Surveys

STOCK IMBALANCES DECREASED

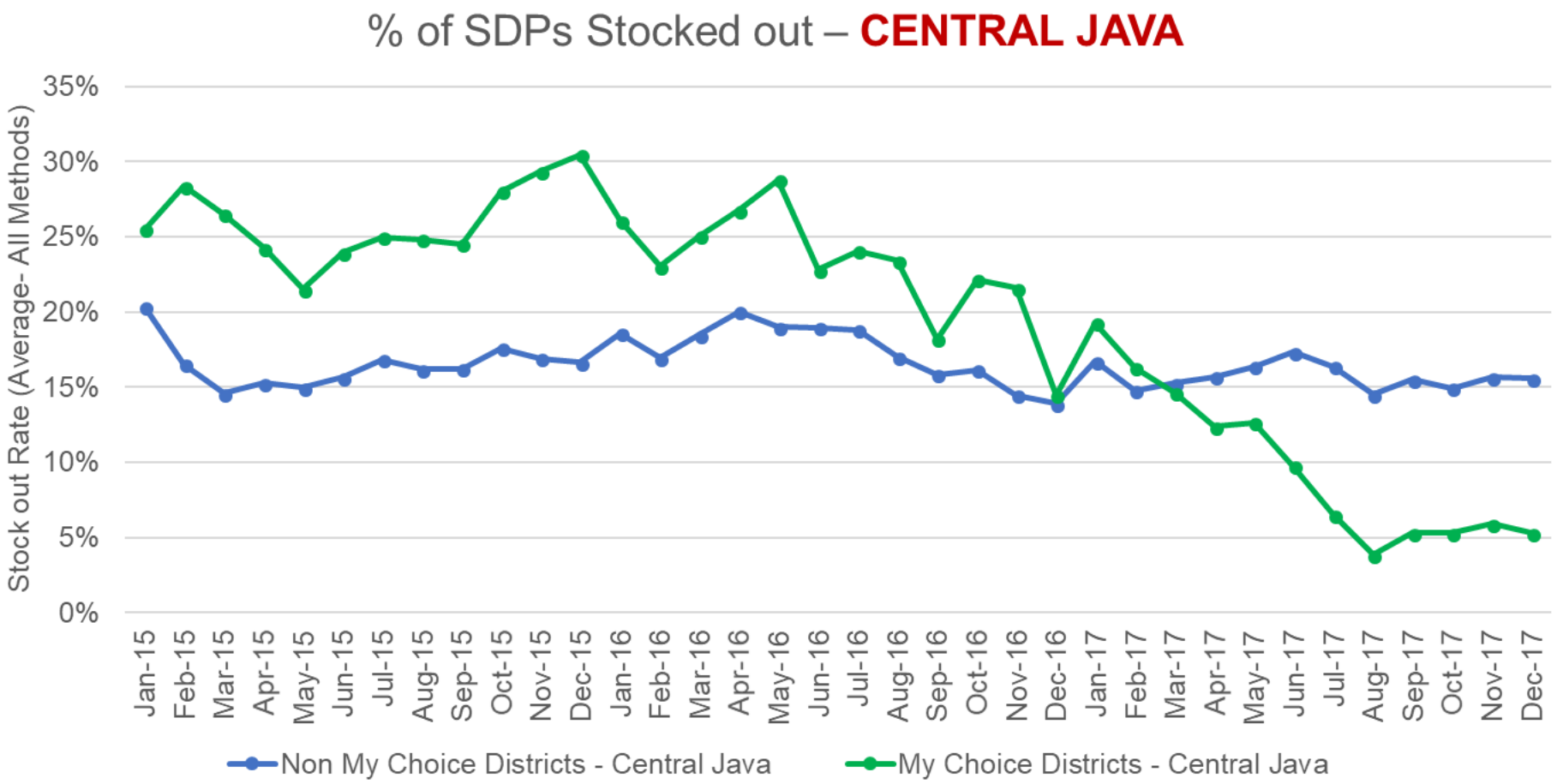
15%
fewer SDPs
stocked out

21%
more SDPs
with adequate stock



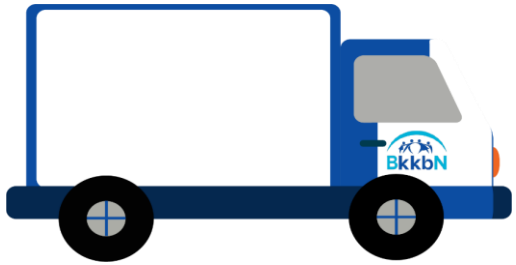
Source: BKKBN eLMIS data – average of Monthly Reports

REDUCED STOCK OUTS

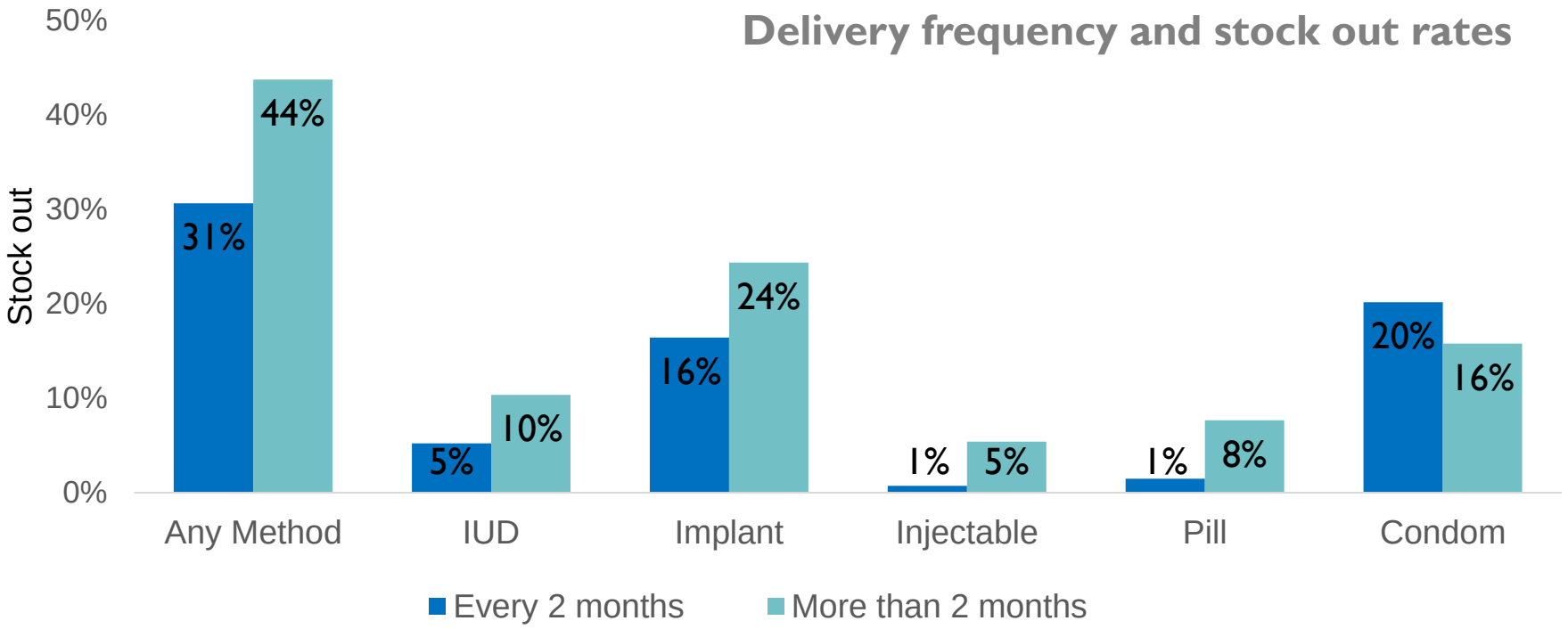


Source: BKKBN eLMIS data

DISTRIBUTION SCHEDULE REDUCED STOCK OUTS



Bi-monthly Distribution



Source: My Choice Endline Survey

STOCK IMBALANCES DECREASED

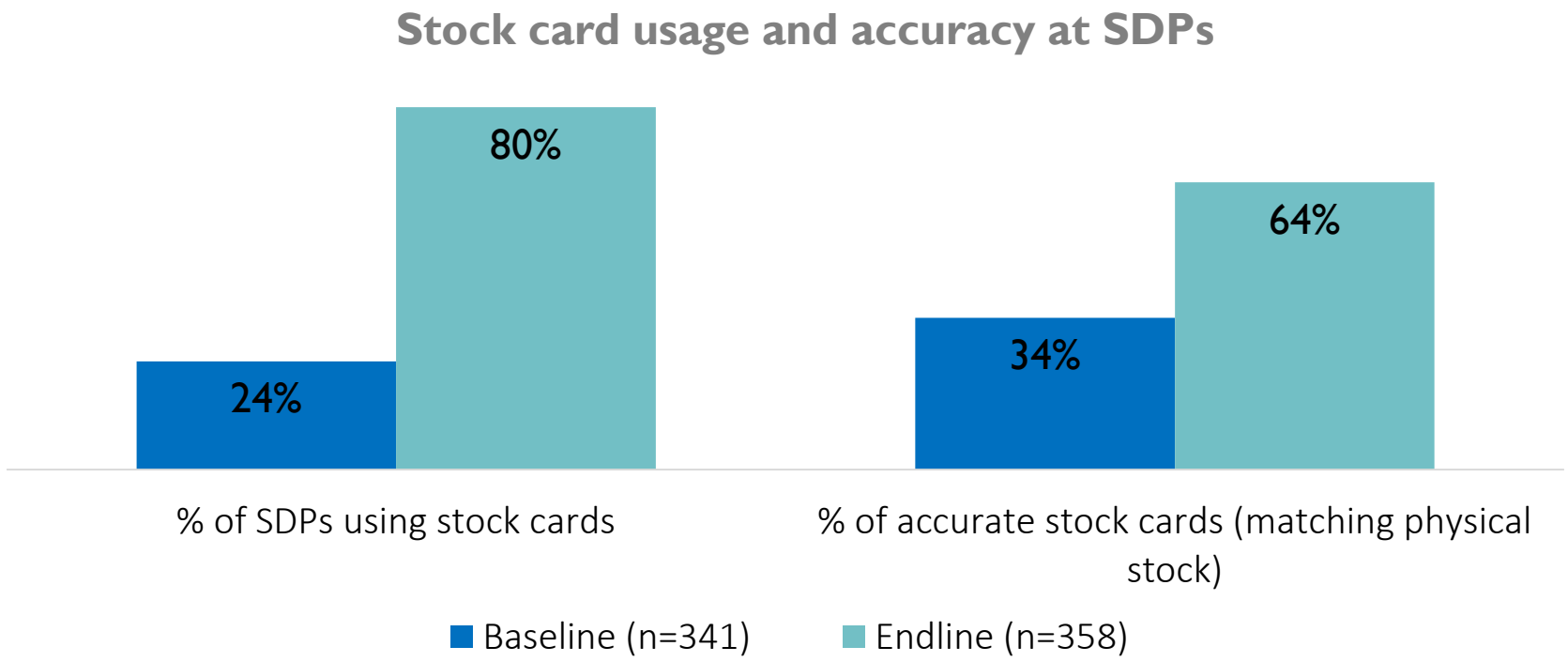
235%

increase in number of SDPs using stock cards

89%

increase in number of accurate stock cards*

**matching physical stock*

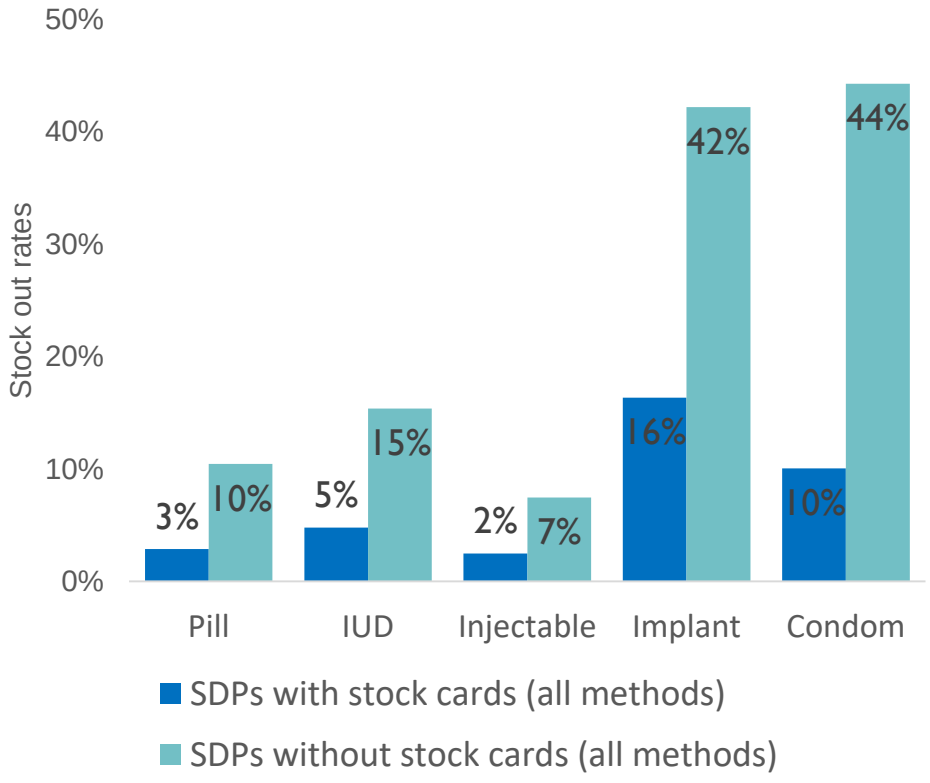


Source: My Choice Baseline and Endline Surveys

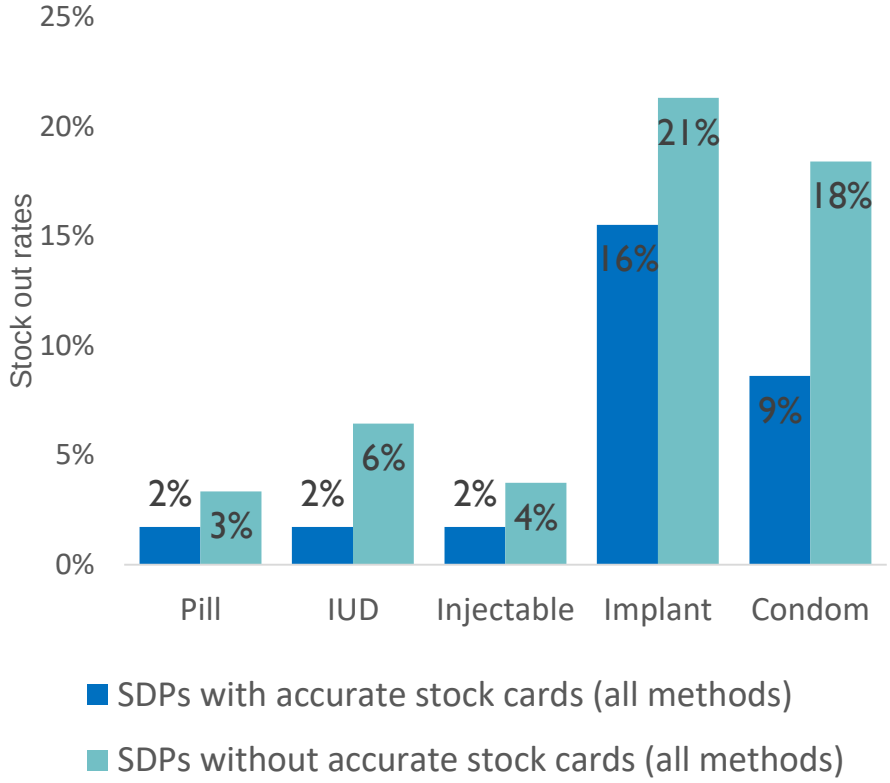
IMPROVED RECORDKEEPING REDUCED STOCK OUTS

Accurate Records + **Accurate Reports** = **Informed Resupply**

Logistics record use and stockout rates



Logistics record accuracy and stockout rates

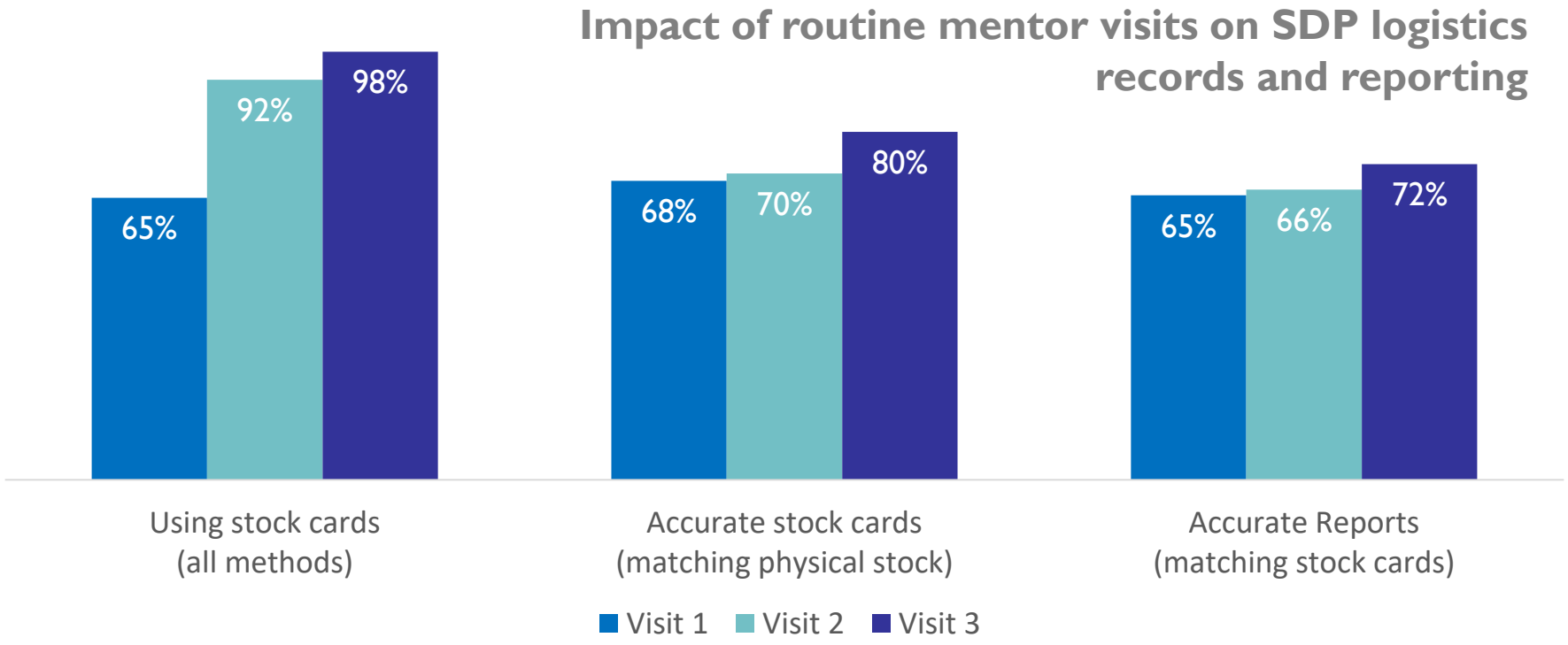


Source: My Choice Endline Survey

ROUTINE MENTORSHIP IMPROVED DATA QUALITY

"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."

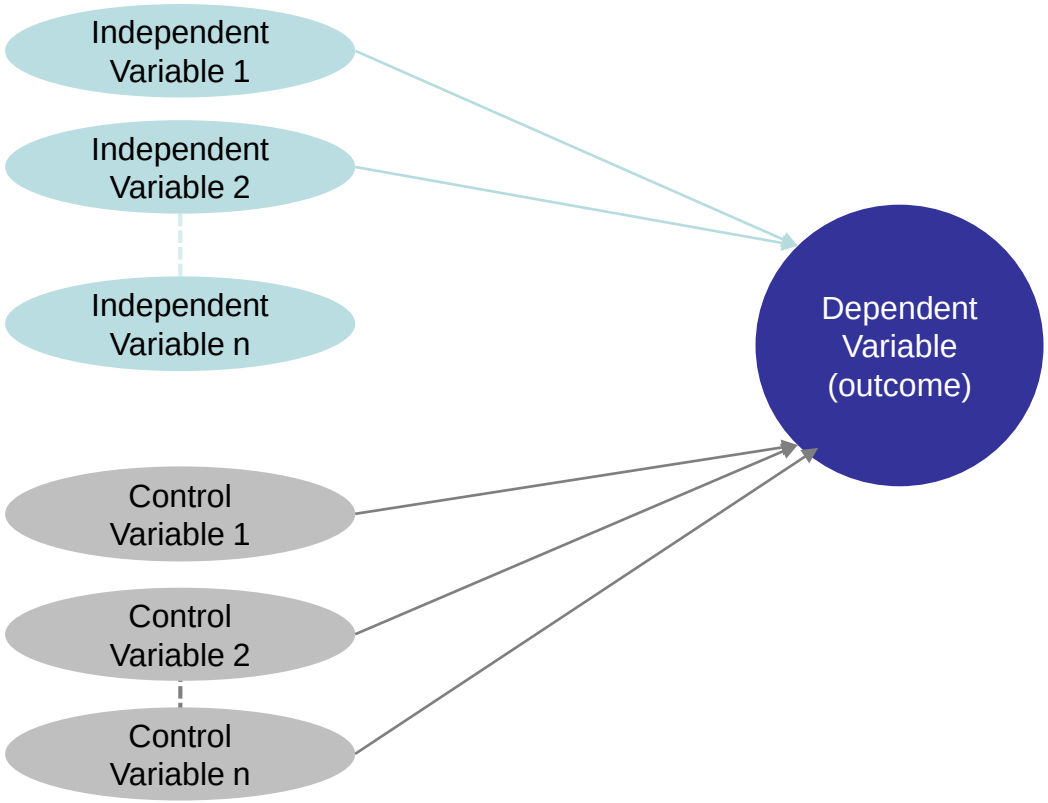
—HEAD OF FP PROGRAM & FINANCE DIVISION, BREBES DISTRICT, CENTRAL JAVA



Source: Mentorship Program Data

EVALUATION METHODOLOGY: EMPIRICAL MODELS

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**

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

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

Logistic Regression Model 2: Drivers of **Stock Card Accuracy**

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

$$Pr(Stock\ Card\ Accuracy_{ij} = 1 \mid X) = \beta_0 + \beta_{Control}\, X_{Control} + \beta_2 Mentorship\ \&\ Job\ Training\ (MOT)_j + \varepsilon_{ij} \quad \text{(b)}$$

DETAILS OF MODELS

Logistic Regression Model 3: Drivers of **Stock-out Today**

$$Pr(Out-of-Stock\ Today_{ij}=1 \mid X) = \beta_0 + \beta_{Control} X_{Control} + \beta_1 Inventory\ Management\ (IM)_j + \beta_2 Stock\ Card\ Usage_{ij} + \varepsilon_{ij} \quad \text{(a)}$$

$$Pr(Out-of-Stock\ Today_{ij}=1 \mid X) = \beta_0 + \beta_{Control} X_{Control} + \beta_3 Stock\ Card\ Accuracy_{ij} + \varepsilon_{ij} \quad \text{(b)}$$

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

$$Pr(Out-of-Stock\ Last\ 3\ Months_{ij}=1 \mid X) = \beta_0 + \beta_{Control} X_{Control} + \beta_1 Inventory\ Management\ (IM)_j + \beta_2 Stock\ Card\ Usage_{ij} + \varepsilon_{ij} \quad \text{(a)}$$

$$Pr(Out-of-Stock\ Last\ 3\ Months_{ij}=1 \mid X) = \beta_0 + \beta_{Control} X_{Control} + \beta_3 Stock\ Card\ Accuracy_{ij} + \varepsilon_{ij} \quad \text{(b)}$$

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

DRIVERS OF STOCK CARD USAGE AND ACCURACY

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	
DV: Stock Card Usage	**(a) LRR**	**(b) MOT**
Logistics Reporting & Recording (LRR)	1.26***	
	(0.35)	
Mentorship & On-the-Job Training (MOT)		1.10***
		(0.29)
Constant	2.91***	-2.45**
Pseudo R Squared	0.40	0.21
Observations	3,269	2,435

	Model 2	
DV: Stock Card Accuracy	**(a) LRR**	**(b) MOT**
Logistics Reporting & Recording (LRR)	-0.01	
	(0.18)	
Mentorship & On-the-Job Training (MOT)		0.30*
		(0.17)
Constant	0.91	-3.41***
Pseudo R Squared	0.09	0.15
Observations	1,993	2,441

**** 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.

DRIVERS OF STOCK OUTS TODAY

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

**** 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.

DRIVERS OF STOCK OUTS IN LAST 3 MONTHS

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	
	(a) Stock Card Users and Non-Users	(b) Stock Card Users Only
DV: Out-of-Stock Last 3 Months	**All**	**All**
Inventory Management	-0.13	
	(0.13)	
Stock Card Usage	-0.26	
	(0.18)	
Stock Card Accuracy		-0.29***
		(0.02)
Constant	0.65	1.48***
	(0.48)	(0.54)
Pseudo R Squared	0.18	0.29
Observations	3,254	1,828

**** 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.

MITIGATION FACTORS FOR STOCK OUTS

Risk factor	Mitigation	Impact
Stock out (today)	Stock card usage (via exposure to LRR and MOT)	An increase in stock card usage leads to an **34% decrease** in the odds of stock outs across all methods
	Stock card accuracy (via exposure to LRR and MOT)	An increase in stock card accuracy leads to a **27% decrease** in the odds of a stock out across all methods
Stock out (last 3 months)	Stock card accuracy (via exposure to LRR and MOT	An increase in stock card accuracy leads to a **29% decrease** in the odds of a stock out across all methods

MITIGATION FACTORS FOR STOCK OUTS

Risk factor	Mitigation	Impact
Stock card usage	Exposure to comprehensive logistics recording and reporting practices, material and exercises	A **253% increase** in the odds of stock card usage
	Exposure to on-the-job mentorship and training program	A **200% increase** in the odds of stock card usage
Stock card accuracy	Exposure to on-the-job mentorship and training program	An **increase** of **35%** in stock card accuracy

WAY FORWARD

Supply Chain Policy Improvements: Improving guidelines and SOPs, building on the successes and lessons learned from the implementation in the pilot regions

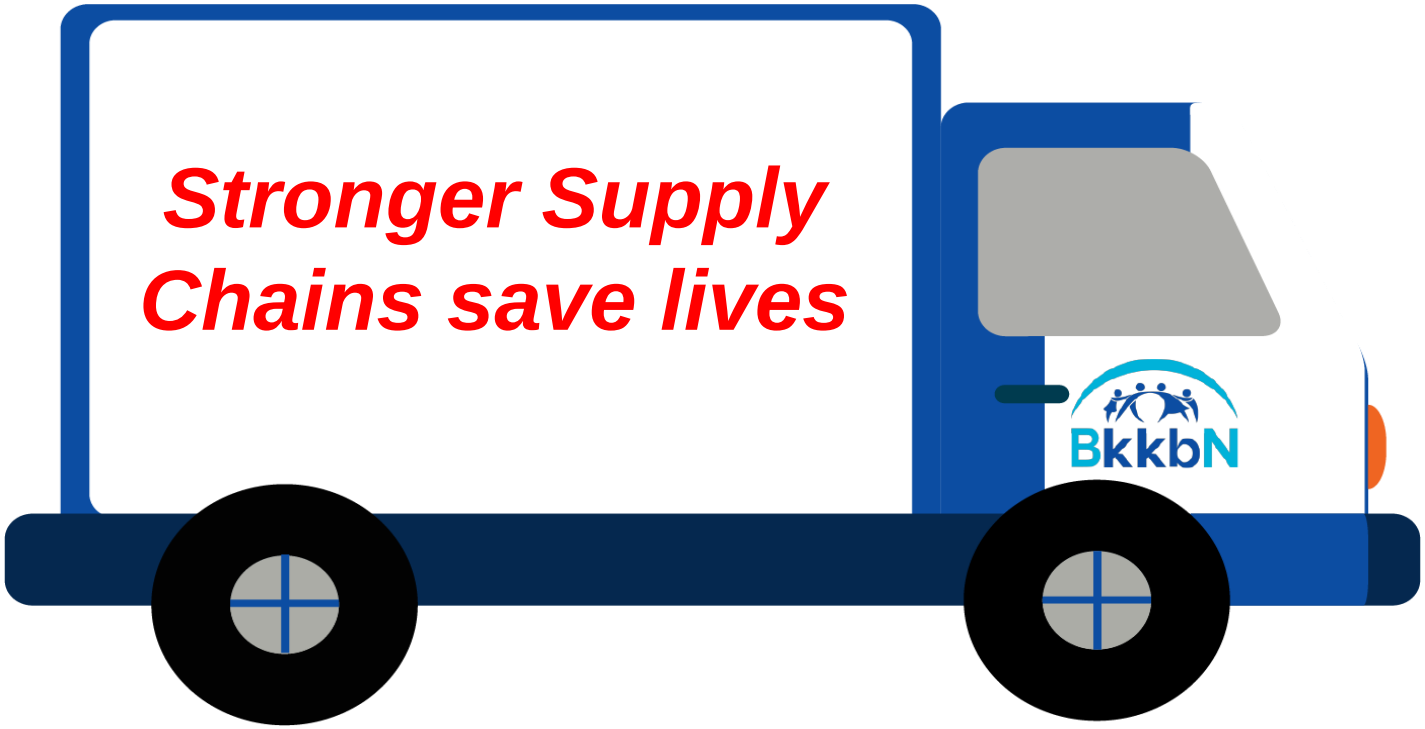
Quantification: Strengthening methodologies and tools to improve forecast accuracy and supply planning

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

TERIMA KASIH



PilihanKu

UNIVERSITY OF MINNESOTA

JSI