

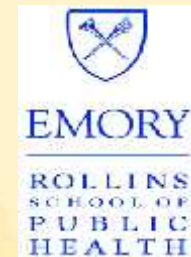


Maternal Nutrition Outcomes in an Integrated Agriculture, Health and Nutrition Program in Western Kenya

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On behalf of the Mama SASHA team

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MAMA SASHA



5 year, quasi-experimental, nutrition, agriculture and health linkages study in Western Kenya (2009-2014)

Can linking vitamin A rich orange-fleshed sweetpotato (OFSP) access and nutritional training to existing health services improve the consumption of vitamin A rich foods and improve maternal and child nutrition?



Integrated Partnerships: International Potato Center (CIP) in collaboration with PATH (International Health NGO), Univ. of Toronto, Emory Univ., CREADIS & ARDAP (2 Local Agricultural NGOs), MoA & MoH



1. COMMUNITY SENSITISATION



**2. ANC CLINIC ATTENDANCE/
NUTRITIONAL COUNSELING**



**3. VOUCHER ISSUING AT
ANC CLINIC**



6. AG EXTENSION ACTIVITIES



5. PREGNANT MOTHER'S CLUBS



4. VOUCHER REDEMPTION

EVALUATION STRATEGY



1. Purposive selection and random allocation of health facilities
 - 4 intervention, 4 comparison facilities in Bungoma and Busia counties
2. Cross sectional baseline and endline surveys
 - Objective: Assess community level impact on diets and child nutrition
 - Design: 2 stage cluster randomized baseline / endline surveys in Mar-May 2011 and Mar-May2014; Detailed costing data for cost-effectiveness analysis
3. Nested Cohort Study (COVA)
 - Objective: Assess individual level impacts on maternal and child nutrition
 - Design: Longitudinal study, 505 women from pregnancy to 9 months postpartum; Multipass 24 hour recalls conducted on 206 mother-infant dyads at 8-10 months postpartum. Intervention effects assessed with two level mixed effects organizational models or three level mixed effects growth models adjusted for clustering, repeated measures and relevant covariates

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Data Type	Enrollment (10-24 wk)	Late third trimester	4m post-partum	9m post-partum
Socio-demographics				
Program uptake				
Food security; dietary diversity; OFSP consumption				
Knowledge of VA / nutrition; OFSP				
Morbidity, health care utilization				
Anthropometry	Mothers	Mothers	Mothers&Infants	Mothers&Infants
Breastmilk retinol and carotenoids			Mothers	Mothers
Micronutrient status: RBP, ferritin, TfR, CRP and AGP	Mothers	Mothers	Infants	Mothers&Infants
Anemia	Mothers	mothers	Mothers	Mothers&Infants
Multi-pass 24 hour recalls (subsample, Table 3)				Mothers&Infants

COVA FINDINGS

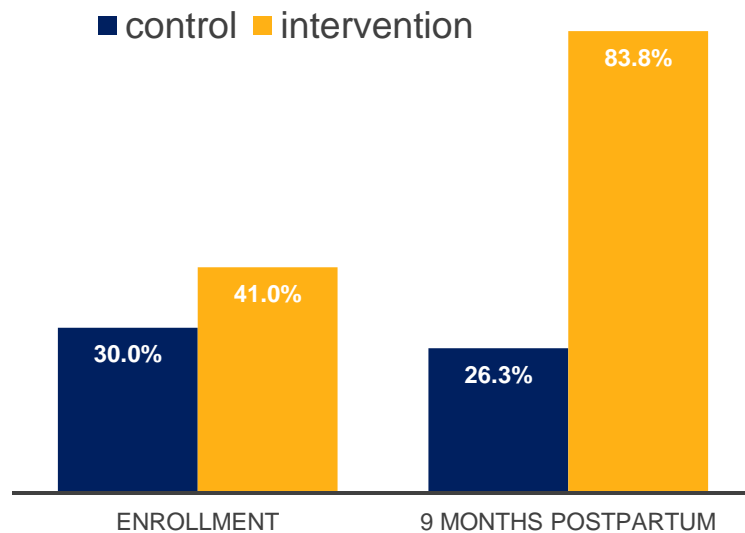


1. Sweet Potato (SP) and Orange Fleshed Sweet Potato (OFSP) Production
2. Maternal Nutrition and Health Knowledge
 - Vitamin A / Vitamin A rich foods
 - ANC / delivery care
 - Optimal IYCF practices
3. Maternal Diets
 - Diet Diversity
 - Consumption of VA rich foods
 - VA intakes (subsample)
4. Maternal MUAC, vitamin A status and anemia

FINDINGS: INCREASED SP & OFSP PRODUCTION



Figure 1: Sweet potato production in previous year



At enrollment (n=505):

- 29 intervention and 4 control women reported OFSP production in past year

At 9 months postpartum (n=384):

- 70% of intervention women produced OFSP compared to <5% of controls
- 92.7% of intervention women received vouchers for OFSP vines
 - Mean times received = 2.80 ± 1.2 .
 - 13 women did not redeem any vouchers due to season, distance to the DVM or not being able to obtain permission to plant

FINDINGS: INCREASED NUTRITION & HEALTH KNOWLEDGE



Table 1: Knowledge and vitamin A index scores increased from enrollment to 9 months postpartum among intervention mothers

Index Scores	Control		Intervention		P-value*
	Enrollment	V1-V4	Enrollment	V1-V4	
Total Nutrition and Health Knowledge	3.36±2.18	1.58±2.23	3.96±2.23	2.63±2.69	0.02
VA knowledge	0.63±1.20	0.13±1.22	2.03±1.39	0.99±1.52	<0.01
IYCF knowledge	2.42±1.28	1.22±1.38	2.34±1.34	3.83±1.64	0.15

*p values estimated for intervention effect adjusted for repeated measures, clustering and baseline values

FINDINGS: GREATER CONSUMPTION OF OFSP



Figure 1: Any OFSP consumption in past 7 days

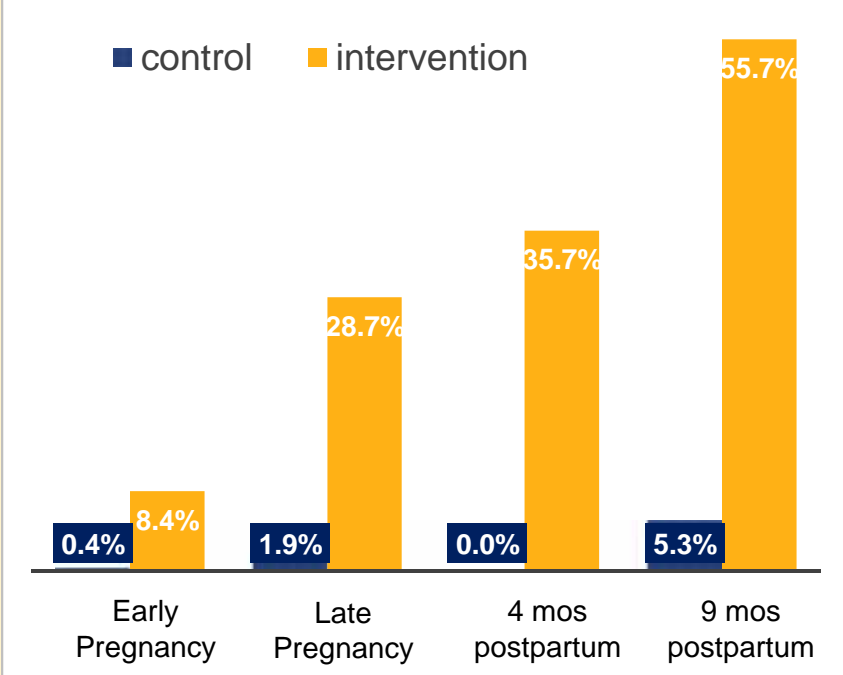
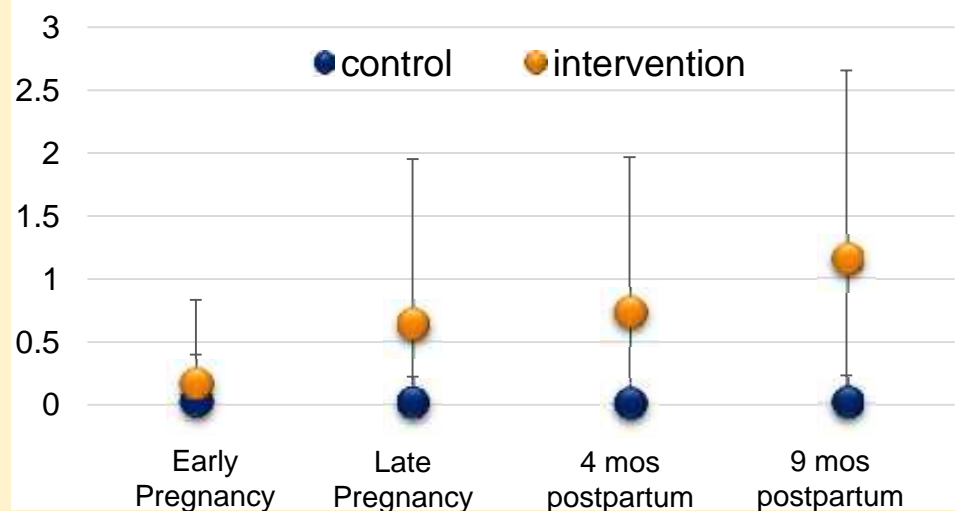


Figure 2: Days OFSP consumed



Variable	Treatment effect p value	Treatment* time p value
1. Any OFSP	0.002	0.09
2. Days consumed	0.003	<0.001

FINDINGS: NO EFFECTS ON OVERALL DIET DIVERSITY



Figure 3: Days consumed VA rich FV

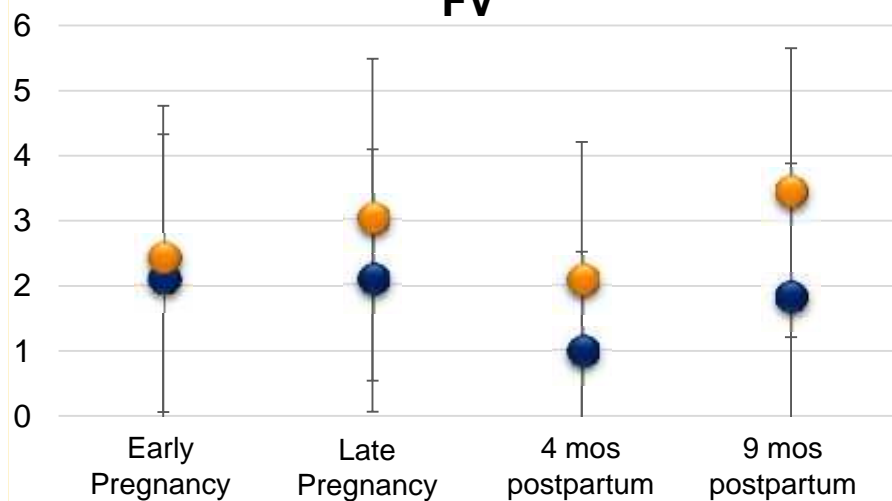
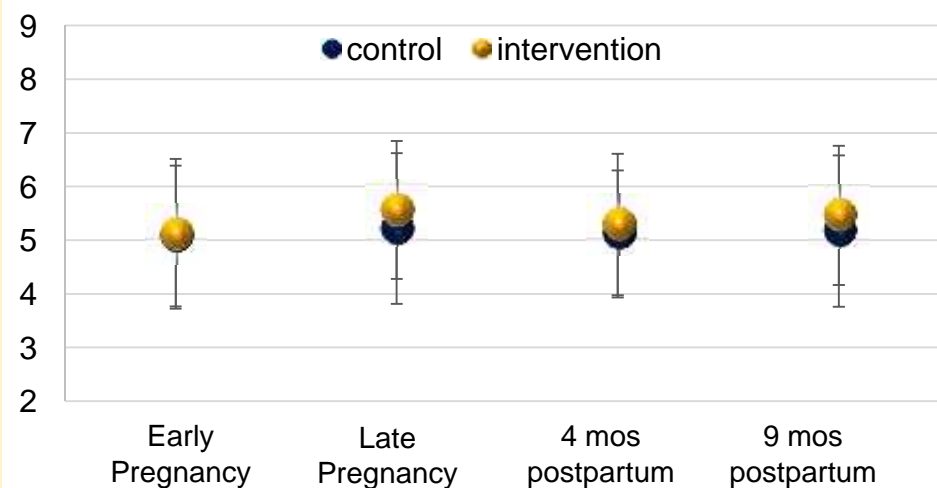


Figure 4: Women's Dietary Diversity Scores



P value for outcomes

Treatment effect

Treatment* time

3. VA rich fruits / veg

0.07

0.21

4. Diet Diversity Scores

0.61

0.10

FINDINGS: INCREASED MATERNAL VA INTAKES



Table 2: Intervention mothers' vitamin A intakes were significantly higher at 8-10 months postpartum (n=206)

	Control	Intervention	P value ²	Adjusted RR (95% CI) ³
Beta carotene, mcg	1420.3 (921.0-2236.4)	1783.1 (1017.0-3582.6)	0.005 ^a	1292.3 (282.5, 2302.2); 0.027
Retinol, mcg	51.2 (40.4-68.4)	59.4 (35.9-76.9)	0.311 ^a	16.4 (-8.12, 40.9); 0.264
Vitamin A, IU	1526.0 (727.1-2588.3)	2298.7 (1006.8-5122.5)	<0.001 ^a	5363.8 (1922.3, 8884.9); 0.002
Vitamin A, RAE	180.8 (135.2-248.1)	238.5 (156.2-379.5)	<0.001 ^a	234.0 (37.5, 430.5); 0.017
Energy, kcal	2539.8 (2168.4-2894.1)	2585.5 (2122.0-3022.3)	0.667	33.7 (-148.2; 215.7); 0.747

FINDINGS: LIMITED IMPACTS ON MATERNAL NUTRITIONAL STATUS



Figure 5: Maternal MUAC

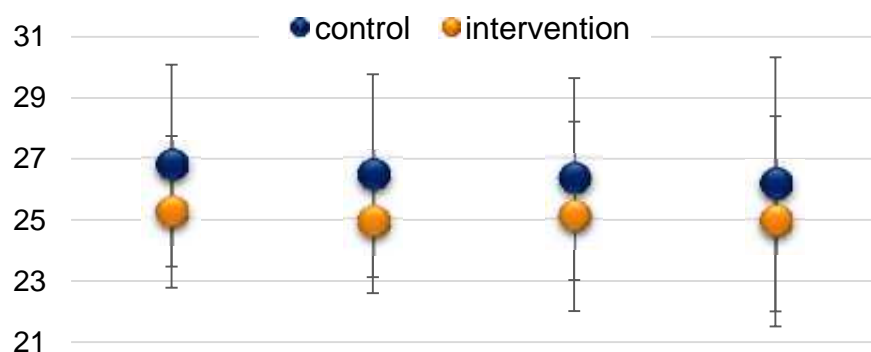


Figure 6: Maternal hemoglobin

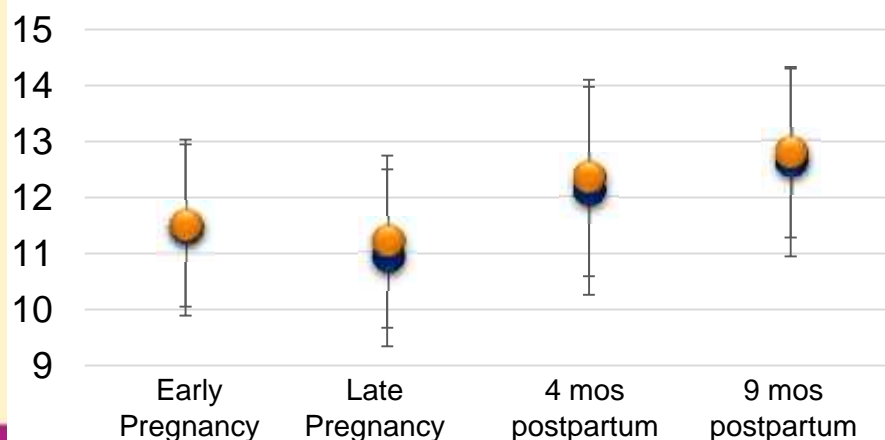
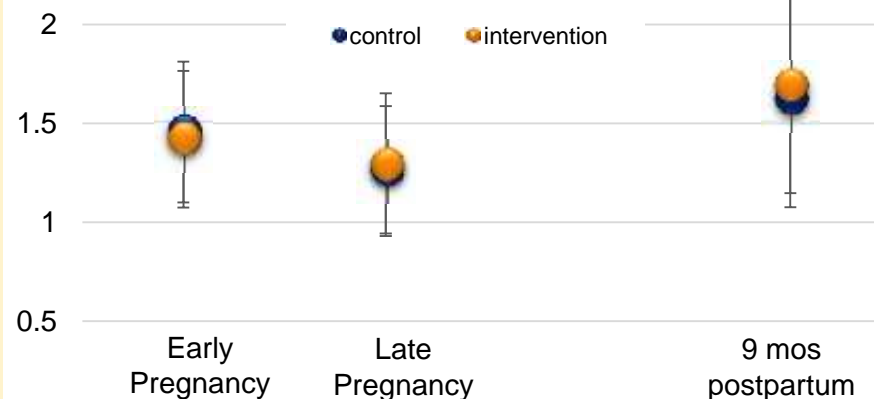


Figure 7: Maternal RBP



P values for outcomes	Treatment effect	Treatment* time
5. MUAC	<0.001	0.08
6. Hemoglobin	0.20	0.54
7. RBP	0.79	0.08

FINDINGS: LIMITED IMPACTS ON MATERNAL NUTRITIONAL STATUS



Figure 8. MUAC < 22cm, %

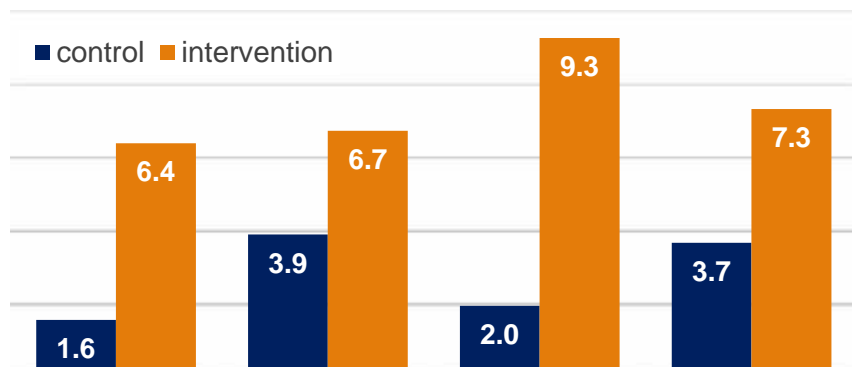


Figure 9. Anemia, %

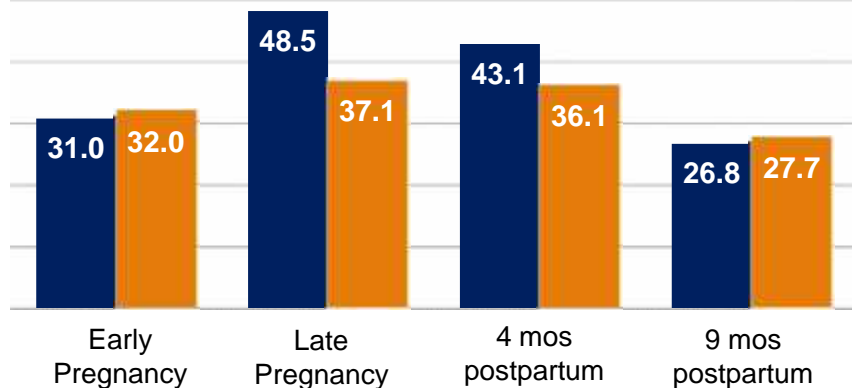
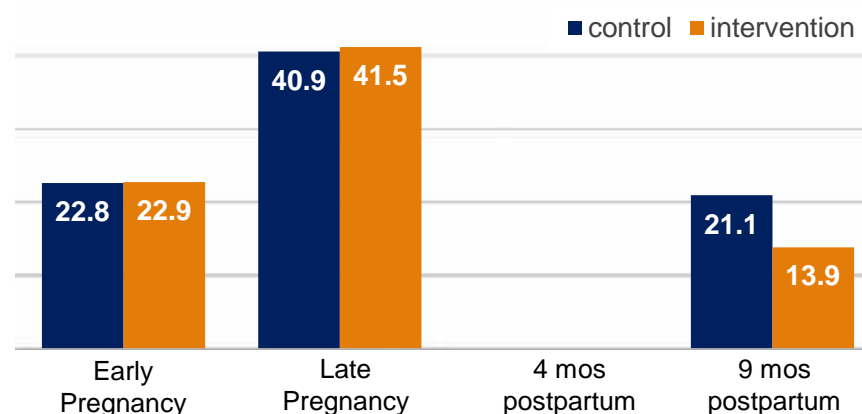


Figure 10. RBP < 1.17, %



P value for outcomes	Treatment Effect	Treatment* time
8. MUAC < 22	0.01	0.46
9. Anemia	0.20	0.97
10. Low RBP	0.77	0.20

CONCLUSIONS



A nutrition and health linkages program that promoted OFSP and provided enhanced nutrition education was associated with.

- **Greater OFSP production**
- **Greater improvements in VA knowledge among mothers**
- **Greater VA intakes among women**
- **Borderline improvements in maternal vitamin A status and anemia in pregnancy**

ONGOING & PLANNED



- Analysis of data from broader evaluation strategy to identify impacts on child nutritional status
- Quantify breastmilk retinol and beta-carotene and identify pathways from maternal intakes to infant status
- Apply structural equation modeling to quantify pathways of effect
- Finalize cost-effectiveness analyses

Thank you from the Mama SASHA Team



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Numerous MPH, MSc and PhD students

Participants, vine multipliers, community health workers and health facility staff

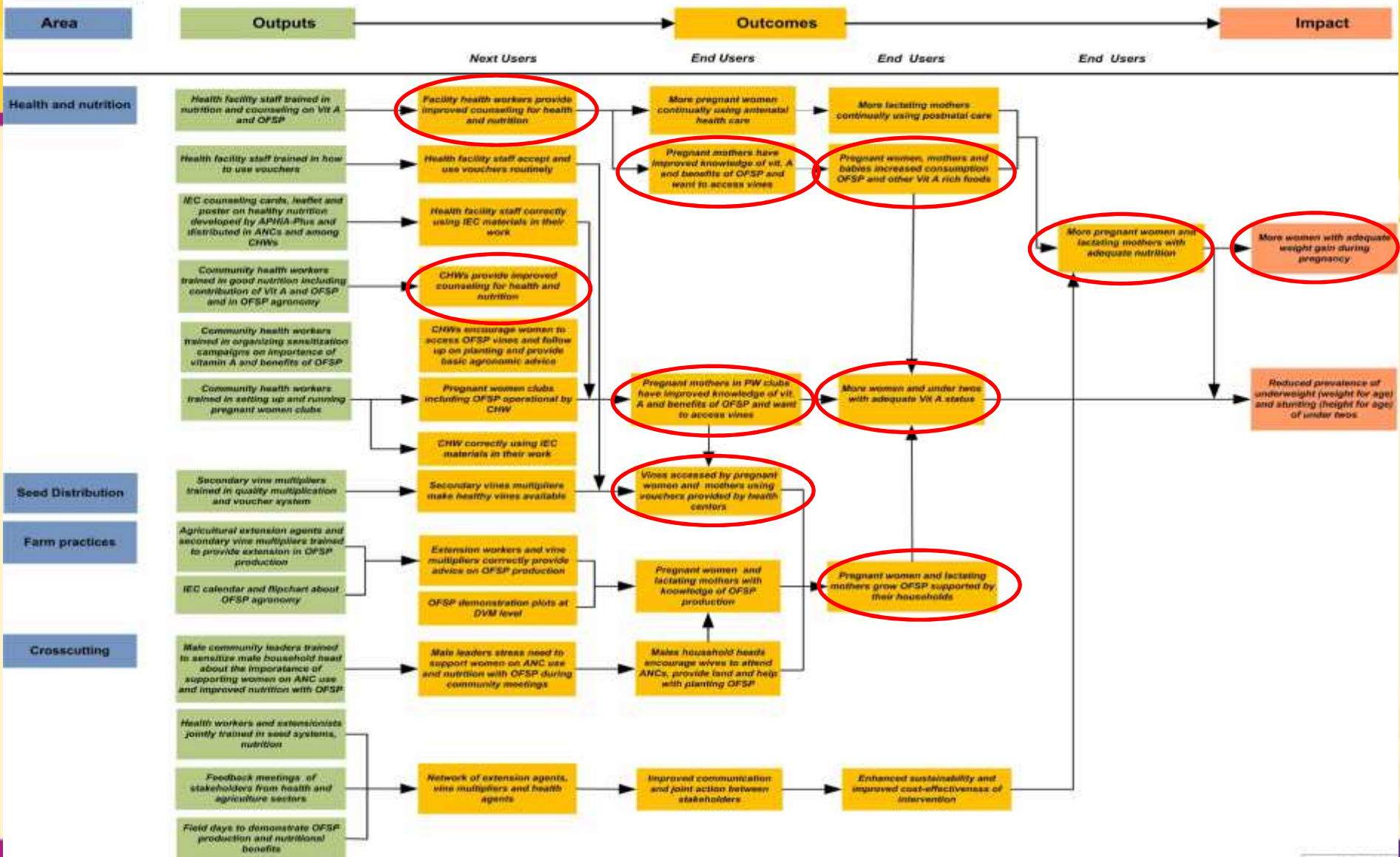
Research assistants, enumerators and support staff

SUPPLEMENTAL SLIDES

STRENGTHS AND CHALLENGES



- Participatory impact pathway clarified theory of change and guided M&E strategy
- Pilot period and integration of lessons learned in PoCP
- Integrated trainings and feedback meetings with health and ag extension
- Operations research suggest activities worthwhile and acceptable to health, agriculture and community actors
- Multilevel modeling strategies produce robust estimates of effect
- Staff turnover and stipend cut demotivated CHWs
- Initial resistance by men / elders Engagement of CHWs
- Low attendance at mothers clubs
- Integrated trainings of health and ag extension
- Small number of clusters introduces analytical bias but mitigated with repeated measures



Characteristics of Mothers at Enrollment



Socio Demographic Variables	Overall (n=505)	Intervention (n= 251)	Control (n= 254)	P value
Maternal age, years	24.3 ± 5.5	24.1 ± 5.5	24.6 ± 5.5	0.326
Gestational age in weeks at enrollment	20.4 ± 5.1	20.5 ± 5.5	20.4 ± 4.7	0.717
Head of Household is Husband / Partner	432 (85.5%)	205(82.0%)	227(89.0%)	0.001
Maternal Education, < Primary	155(30.7%)	68(27.2%)	87(34.1%)	0.251
Mother is married/ partnered monogamous	399 (79.0%)	194 (77.6%)	205 (80.4%)	0.410
Maternal Occupation				
<i>Does not work remuneratively</i>	200 (39.8%)	120 (48.0%)	80 (31.4%)	0.000
<i>Agriculture</i>	168 (33.4%)	63 (25.2%)	105 (41.2%)	
<i>Salaried employment</i>	25 (5.0%)	15 (6.0%)	10(3.9%)	
<i>Informal business</i>	54 (10.7%)	17 (6.8%)	37(14.5%)	
<i>Others</i>	56 (11.1%)	34(13.6%)	22(8.6%)	
Head of Household Occupation				
<i>Does not work</i>	68(13.5%)	47 (18.10%)	21 (8.2%)	0.000
<i>Agriculture</i>	104(18.7%)	31 (12.5%)	63 (24.7%)	
Wealth / Asset Index Score	8.55 ± 1.77	8.54 ± 1.92	8.55 ± 1.62	0.99
Number of children < 5 y*	1 (0, 1)	1 (0, 1)	1 (0, 2)	0.13

*presented as median (25th, 75th percentiles)

Characteristics of Mothers at Enrollment and Delivery



Food Security and Nutrition at Enrollment	Overall	Intervention (n=251)	Control (n=254)	P value
Household Food Insecurity Category				
Secure / mild	276 (55.1%)	131 (54.1%)	145 (57.8%)	0.2210
Moderate	102 (20.6%)	58 (24.0%)	44 (17.5%)	
Severe	115 (23.3%)	53 (21.1%)	62 (24.7%)	
Maternal RBP, $\mu\text{mol/L}^*$	1.44 \pm 0.3	1.42 \pm 0.3	1.46 \pm 0.3	0.245
Maternal RBP <1.05 $\mu\text{mol/L}^*$	110 (21.8%)	54 (21.7%)	56 (22.0%)	0.104
Maternal ferritin < 12mg/dL*	114 (22.6%)	63 (25.3%)	51 (20.0%)	0.155
Maternal Hb < 11.0 g/dL	159 (31.5%)	80 (32.0%)	79(31.0%)	0.841
Maternal MUAC, cm (N=505)	26.0 \pm 3.0	25.3 \pm 2.5	26.8 \pm 3.3	0.000
Birth Outcomes				
Gestational age at delivery	39.6 \pm 1.12	38.8 \pm 3.6	39.2 \pm 3.5	0.32
Infant weight within 1 week of delivery	3.42 \pm 0.55	3.39 \pm 1.03	3.37 \pm 0.86	0.83
Infant sex, % Female	187 (46.8%)	94 (48.2%)	943 (45.4%)	0.57

*RBP and ferritin adjusted for inflammation using correction factor method; Anemia adjusted for altitude

COVA LOST to FOLLOW UP

- 505 women enrolled
- Retention rates were similar across treatment arms (76% and 77%) but differed across the 8 facilities (63% - 86%)
- Women retained to 9 months (n=384) were more likely to be partnered / married
- No other differences observed

