

The MAHAY Pilot: Tackling stunting and promoting child development through integrated interventions in Madagascar

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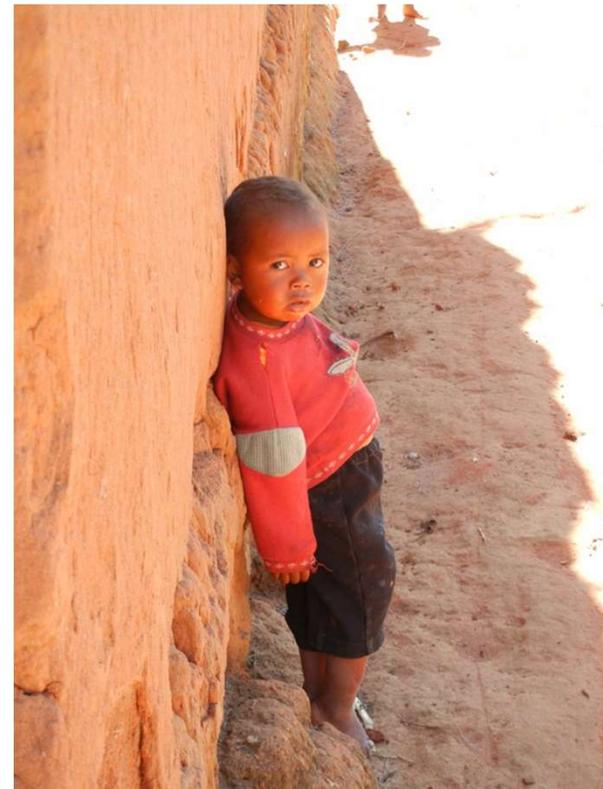
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- World Bank operational team: Jumana Qamruddin, Voahirana Rajoela, Valerie Ranaivo, Lisa Saldanha
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Outline

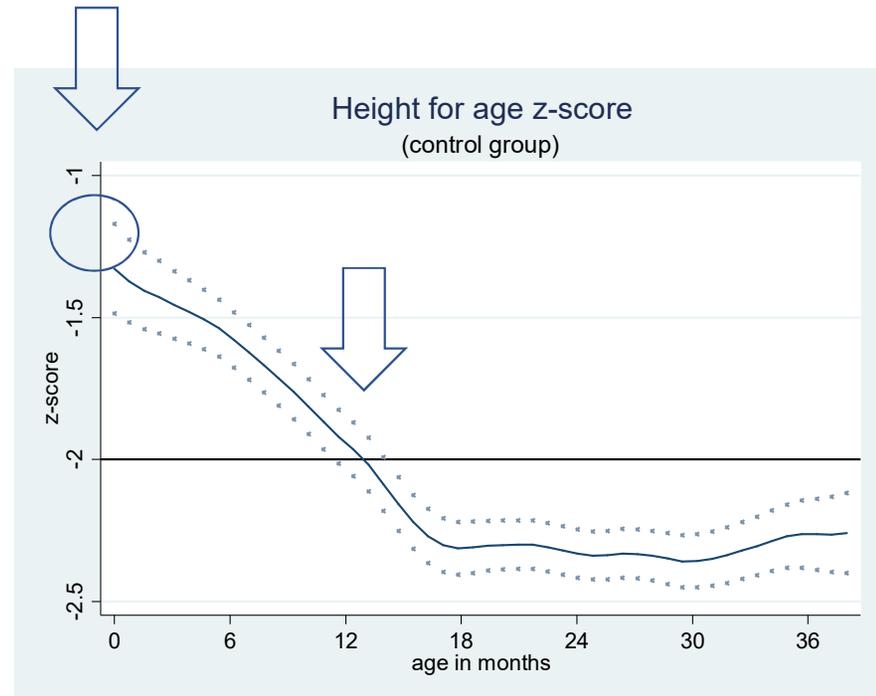
- 1. Context and Background
- 2. Madagascar's National Community Nutrition Program (PNNC)
- 3. The Mahay Pilot: Rationale and Design
- 4. The Mahay Pilot: Results
- 5. The Mahay Pilot: Conclusions
- 6. Informing Policy



1. Context and Background

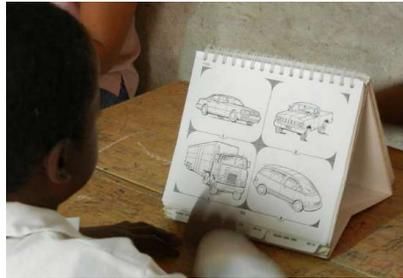
(i) The narrow(er) window of opportunity in Madagascar

- ~50% children under 5 y moderately or severely stunted
- Stunting starts during pregnancy: 25% of the children are born stunted
- On average children are stunted by **12m** of age (as opposed to 24m).

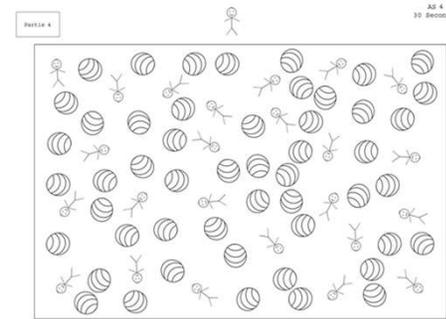
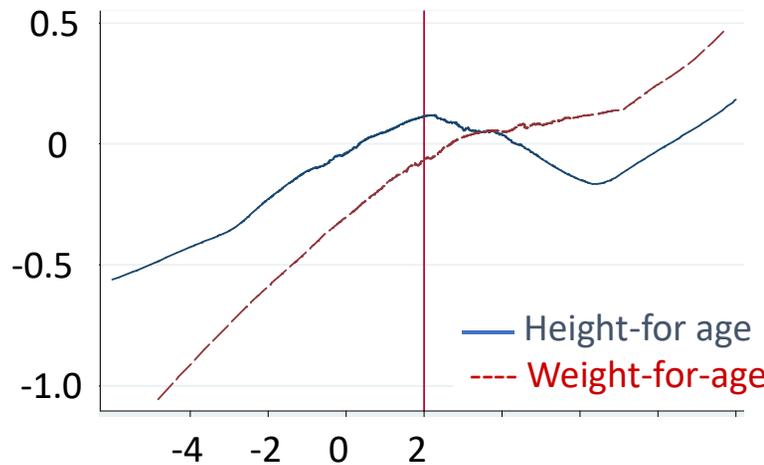


Source: Etude Mahay, control group

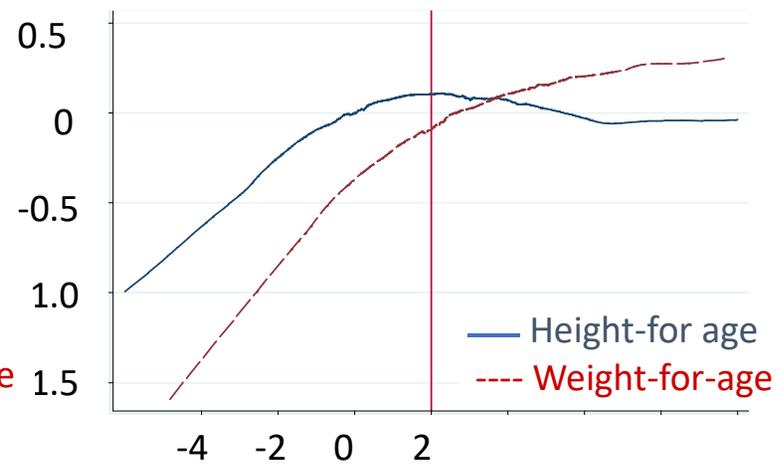
Early nutritional status (0-3y) associated with better skills during school age (7-10y)



Vocabulary (z-score)



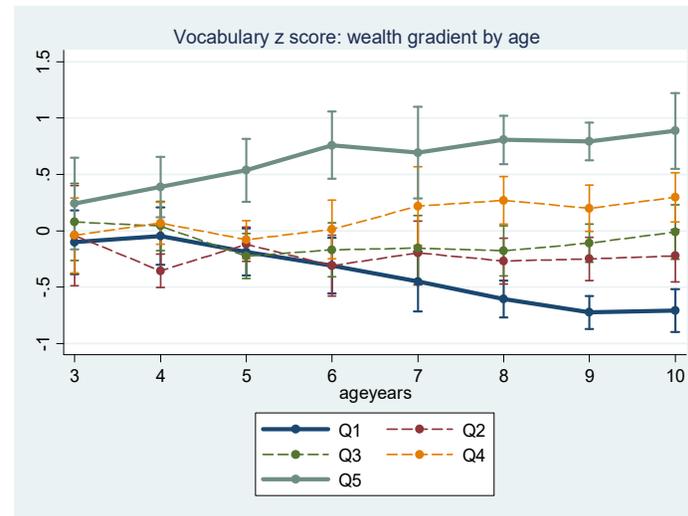
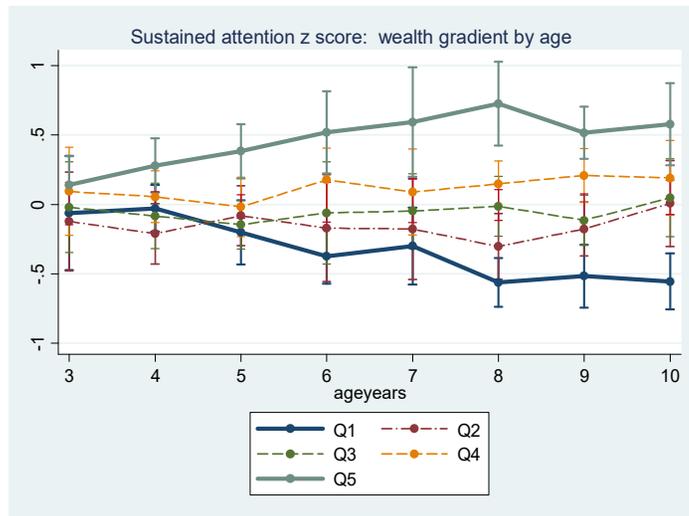
Sustained Attention (z-score)



Anthropometric z-score

Own calculations: Enquete Anthropometrique et de Developpement des Enfants 2004-2011

Equity: investing early can prevent learning gap



- Large socio-economic gradients in childhood development emerge early even in low income environments
- Widen with age before school and map into sizeable learning gaps
- 20% gaps mediated by home environment

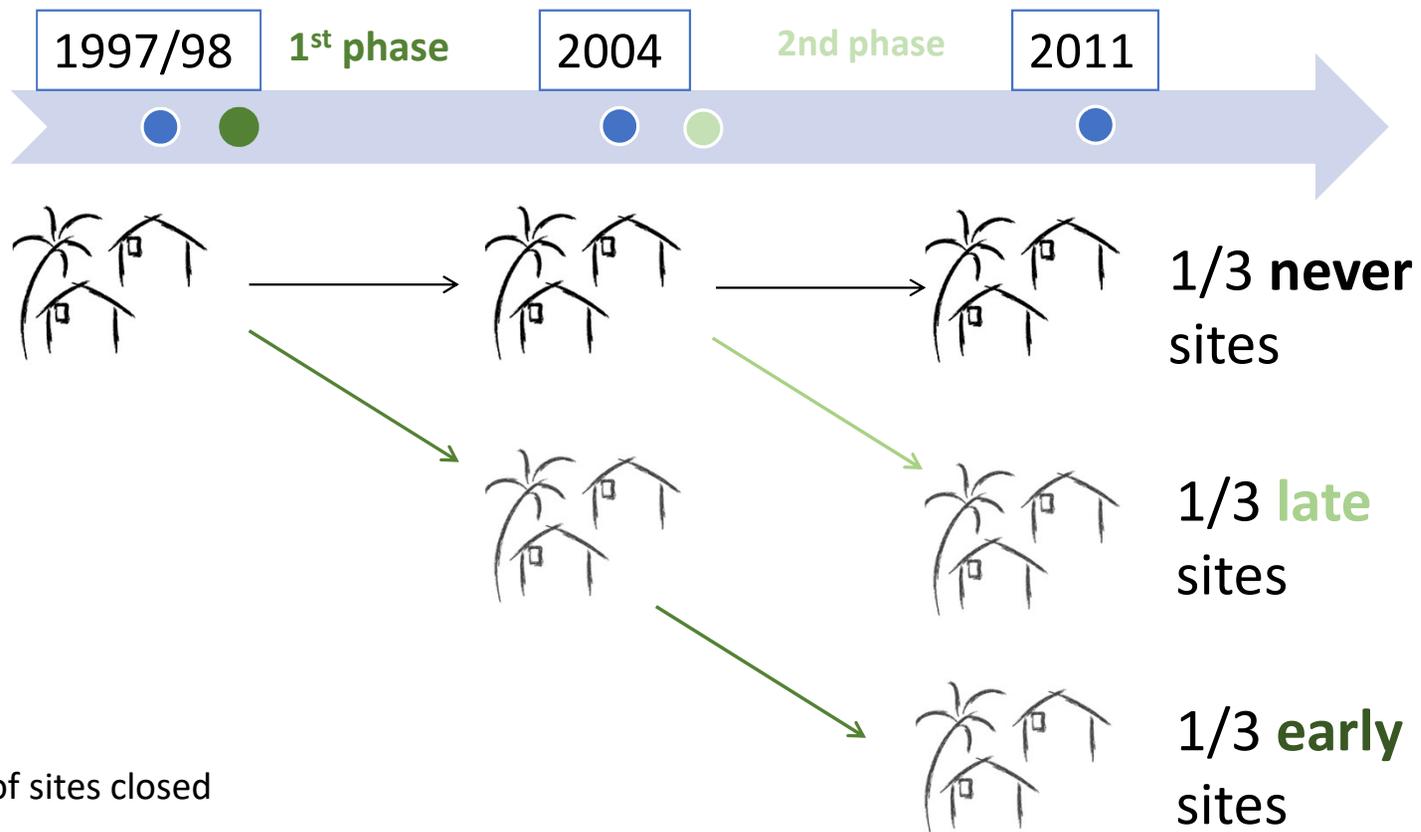
2. Madagascar's Community-Based Nutrition Program

An existing at scale service delivery platform

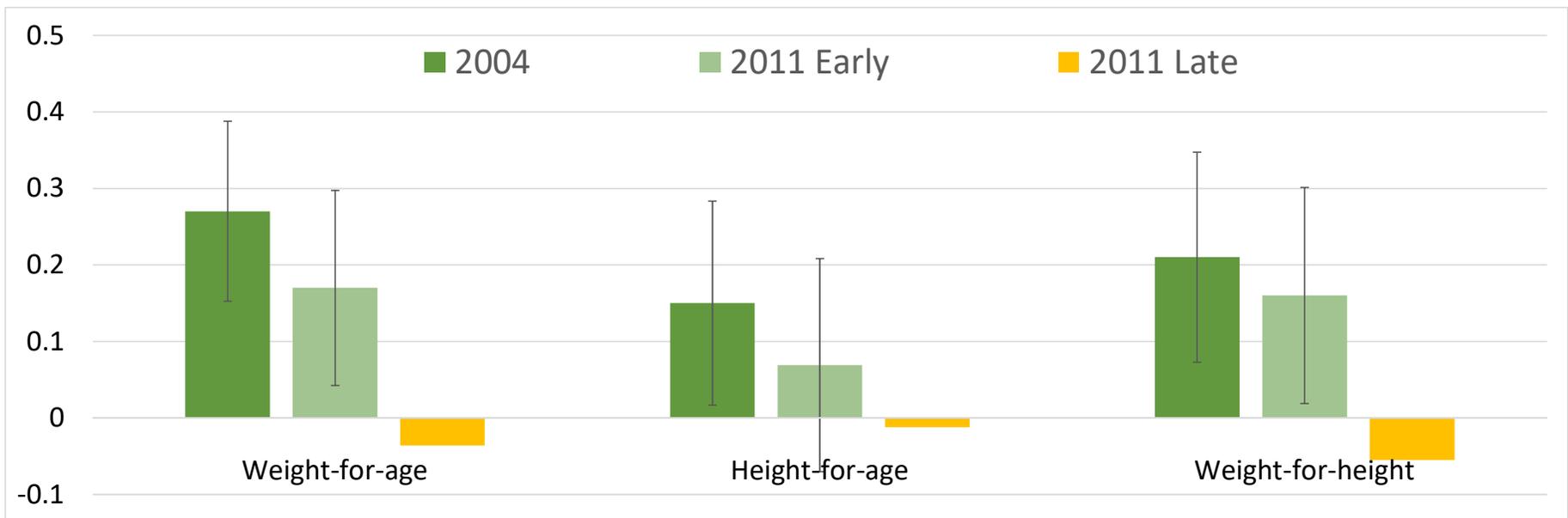
- Long standing program, starting in 1999
 - Focused on growth monitoring/promotion and nutrition education
 - Surveillance acute malnutrition + referral to health centers
 - 1 Locally elected Community Health Worker
 - Communities with ~ 100 children 0-2 years old
 - Broad coverage across the country, scaled-up since mid 1990s



A long term evaluation of the program (1997-2011)



The challenges of scaling-up



- Employed Difference in Difference methodology with staggered adoption
- Benefits on nutritional outcomes (WAZ) among early adopters, sustained over time

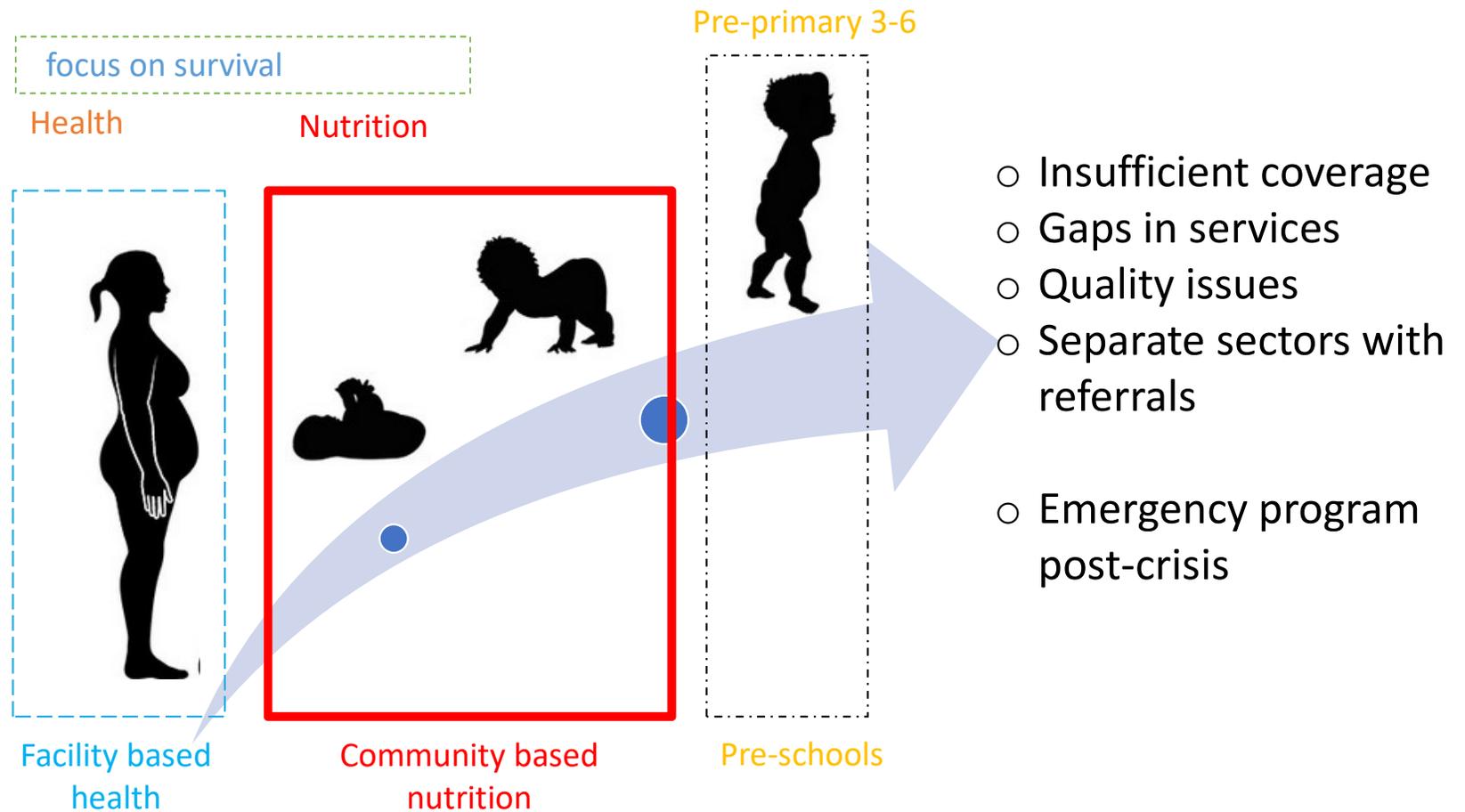
Why? Loss of focus on quality



- **Rapid expansion** to new sites without attention to quality of training
- **Increased population** pressure brings about larger workloads for the nutrition workers
- Inclusion of **children 3-5** drain on nutrition worker resources

3. The *Mahay* Pilot: Rationale and Design

Our starting point: Madagascar's ongoing nutrition program



We embedded Mahay into the existing at scale service delivery platform

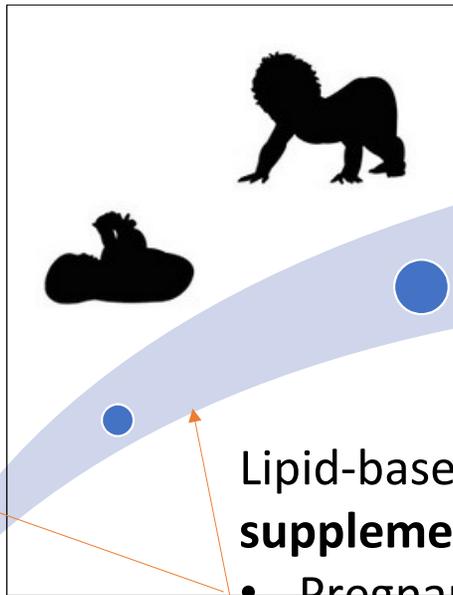
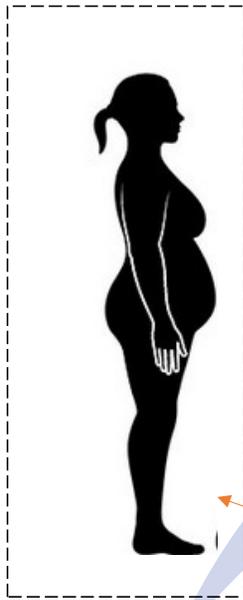
- Back to the drawing board to tackle stunting and promote early child development:
 - Target pregnancy and infancy – first 1000 days
 - Use the existing program (PNNC) as a counterfactual (T0)
 - Feasible policy space post crisis? Integration with nutrition-sensitive interventions not feasible
 - Test new ‘add-ons’ in a cluster RCT:
 - Expand the quality/intensity and scope of the existing program: test value added and mechanisms
 - Assess cost effectiveness for scale up

Mahay Study: intensifying quality and scope

Added community worker for home visits

- *Bangladesh exchange with BRAC/A&T*

Intensive Counseling to address barriers to change



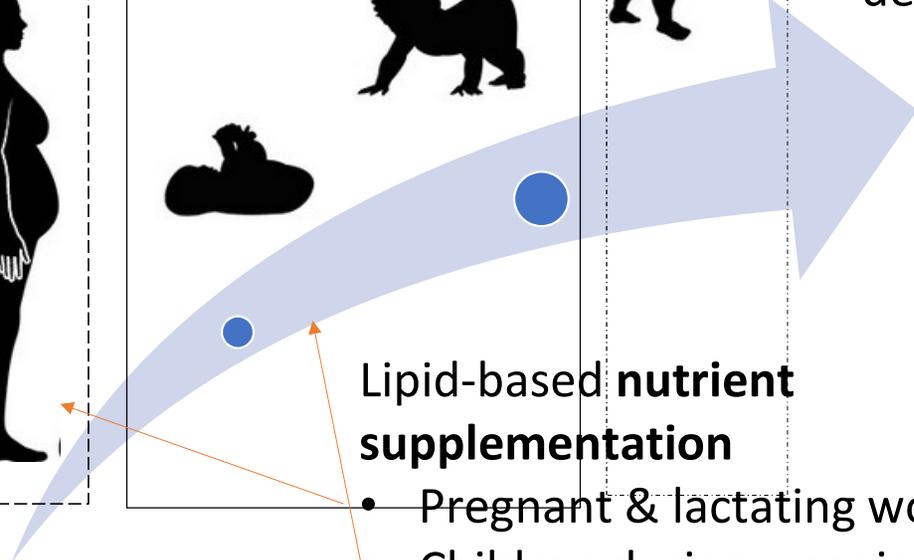
Early stimulation to improve development

- *Global evidence/local expertise adaptation of Reach Up Jamaica*

Lipid-based nutrient supplementation

- Pregnant & lactating women
- Children during weaning

- *UCDavis/Gates studies, with potential local production*



Mahay Study Design: a clustered RCT

T0	T1	T2	T3	T4
			LNS for P&L women: 40 g, 235 kcal LNS for children 6-18m: 20 g, 118 kcal	Child stimulation, home visits 2x/mo
Existing U-PNNC program with a focus on first 1000 days in group counseling sessions, growth monitoring, and cooking demonstrations				

Mahay research questions

- ❑ How does each strategy affect linear growth faltering and child development? (T1-T4 vs T0)
- ❑ Does the timing/duration of supplementation make a difference? (T2 vs T3)
- ❑ What is the value added of integration?
 - **T2,T3 vs T1:** does counseling alone affect behaviors and child outcomes? Direct effect supplementation/ behavior
 - **T4 vs T1:** does counseling on early stimulation enhance the impact of nutrition counseling on child outcomes?
- ❑ Cost effectiveness

T1: intensive counseling in home visits

- ❑ Added social worker (CHW) to reinforce behavioral change through home visits (as in BRAC-Alive&Thrive Bangladesh)
- ❑ Preventative home visits starting once during pregnancy, with decreasing frequency (monthly 0-8, bimonthly 9-12, quarterly 12-24) as opposed to *curative* (home visits after growth faltering)
 - enhanced training with emphasis on listening skills, problem solving and addressing barriers (food diversity, animal source food, prenatal/postnatal visits, basic food security)

T2: T1 + lipid based supplementation to *children 6-18m*

- preventive lipid based supplement (not curative as in PlumpyNut)
- In-kind transfer with comprehensive nutrient content: micro- (iron, zinc, essential fatty acids, vitamin A, folic acid, vitamin C) **AND** macro-nutrients (fats, proteins, carbohydrates)
 - 2 daily sachets 10g
 - Cost ~ 3.65\$/child/month (~ 10,900 MGA)
 - 118 kcal, ~100 % of the recommended nutrient intakes (RNI), 9.9g fats, 2.6g proteins
- Cost benchmark:
 - CCT transfer in Madagascar (15,000 MGA UCT, + 5,000/child 6-12yo)

T3: T2 with supplementation to *pregnant/lactating women*

- Supplement during pregnancy and lactation (-6,6) in addition to children 6,18m:
 - 40g/day, 235 kcal, 1-2 x recommended dietary allowance (RDA) of micronutrients for pregnant women, 19.7g fat and 5.2g proteins
 - Cost ~7.30\$/woman/month (~ 22,000 MGA)



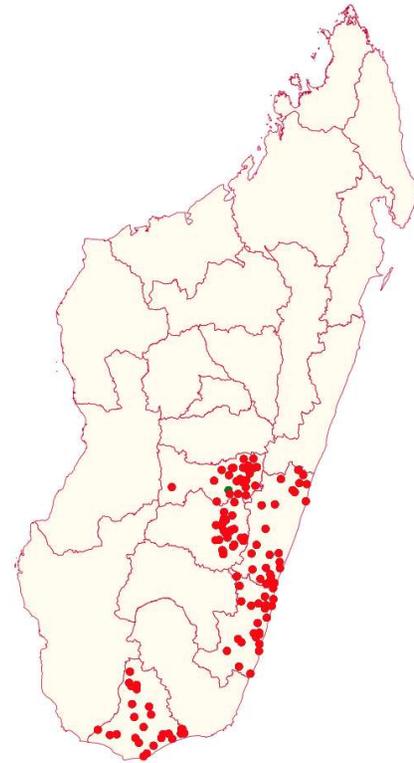
T4: integrated nutrition and early stimulation

- ❑ local adaption protocol from the Reach Up and Learn Jamaica
 - high investment in training and coaching
- ❑ bi-monthly home visits 6-30 months of age in addition to the nutrition counseling



Randomization and sample selection

- 125 Clusters
 - Stratified, 5 regions
 - 25 clusters per arm
 - T1-T3 delivered to all eligible households, T4 to study sample
- Total sample at baseline n=3750
 - Stratified sampling, 3 age cohorts
 - 10 households per age cohort per cluster
 - Replaced if moved permanently out of catchment area. (not if died)



Outcome measures

- **Primary outcomes**

- Growth: Height-for-age z-score and weight-for-height z-score
- Child development: communication, cognitive, socio-emotional, and motor development (ASQ-I), direct assessment (Bayley III subsample)

- **Secondary outcomes**

- Anemia
- Iron & vitamin A status, inflammation (subsample biomarkers)
- Child morbidity

- **Intermediate measures**

- Dietary diversity, food security
- Play and stimulation practices
- Maternal knowledge of child care and feeding practices

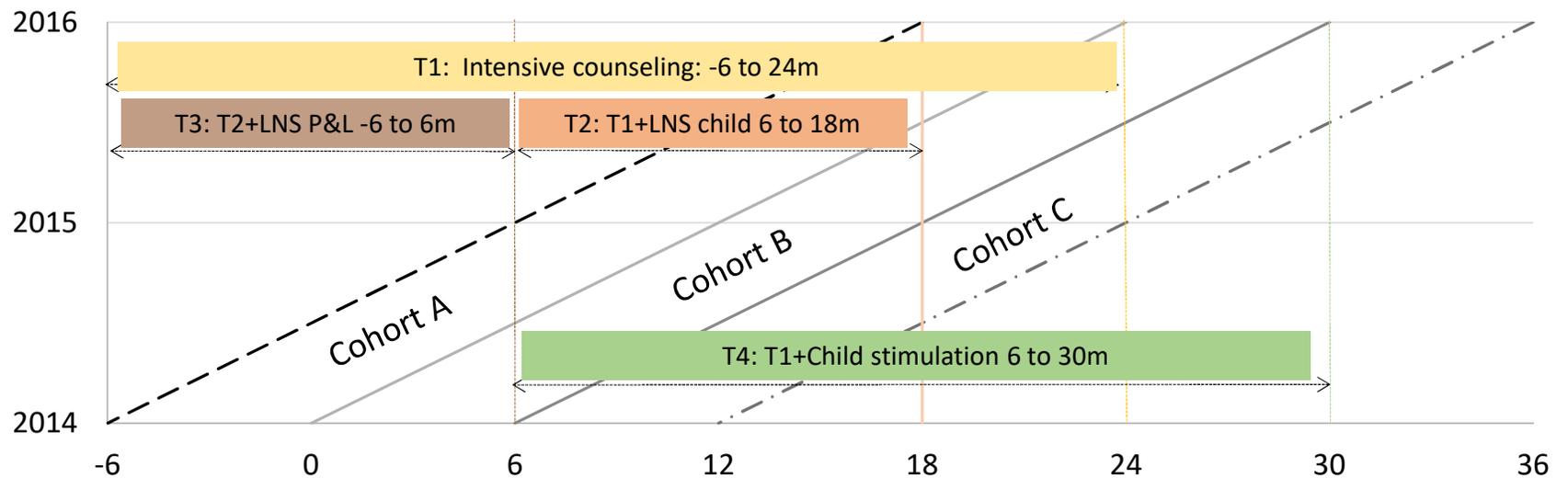
- **Pre-specified interaction testing published protocol**

[Fernald, Galasso, Qamruddin, Ranaivoson, Ratsifandrihamanana, Stewart, Weber \(2016\) "A cluster-randomized, controlled trial of nutritional supplementation and promotion of responsive parenting in Madagascar: the MAHAY study design and rationale" *BMC Public Health*; 16:466](#)

Timeline



Cohorts: duration of exposure



Target age cohort	Baseline 2014	Midline 2015	Endline 2016	
A	-6 to 0 m	6 to 12 m	18 to 24 m	➤ A full exposure to T3
B	0 to 6 m	12 to 18 m	24 to 30 m	➤ A and B fully exposed to T2
C	6 to 12 m	18 to 24 m	30 to 36 m	➤ C longest exposure to T4

4. Mahay Pilot: Results

Galasso, Fernald, Weber, Ratsifandrihamanana (2019) The effects of nutritional supplementation and promotion of responsive parenting on young children in Madagascar: A cluster-randomised, controlled trial" *The Lancet Global Health*

Impact on growth: key interaction with age

	Height for age z-score mean[SD]	Weight-for-height z- score mean[SD]
T0	-2.35 [1.06]	-0.32 [0.91]

No overall effect of T1-T4 on HAZ/WHZ

Key interaction with age: youngest cohorts in T2-T3 had

- 0.2 and 0.216 SD \uparrow HAZ
- 9pp and 8.2 pp \downarrow stunting

- No difference T2-T3

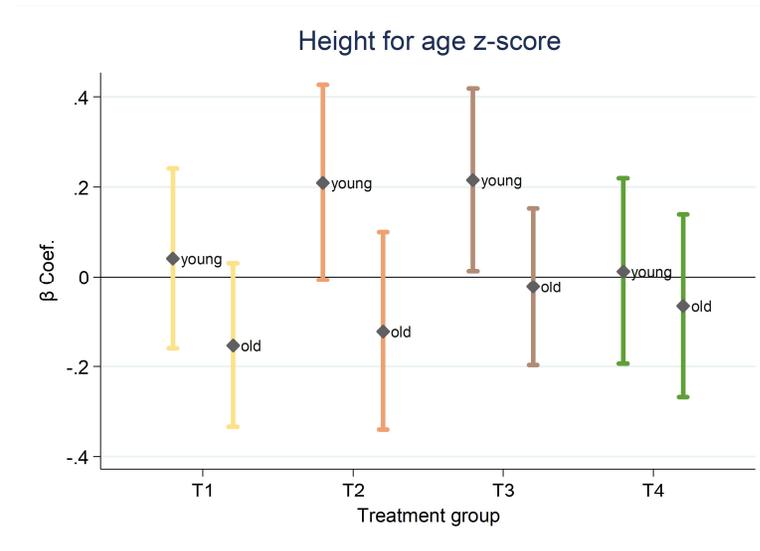
T0: Existing program

T1: T0+ Intensive counseling

T2: T1+LNS child

T3: T2+LNS P&L

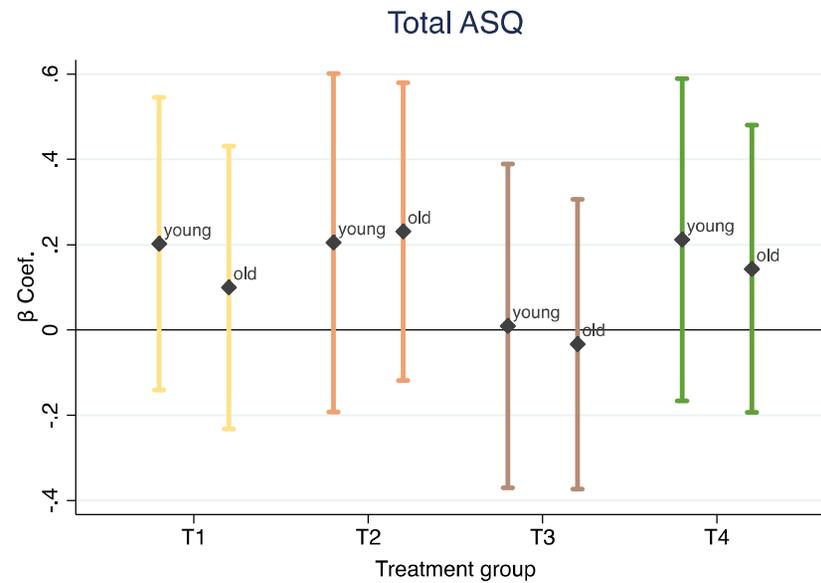
T4: T1+Child stimulation



Impact on child development

	ASQ overall score, age standardized mean[SD]
T0	-0.110 [1.02]

No overall effect of T1-
T4 on child development
(or sub-domains)



T0: Existing program

T1: T0+ Intensive counseling

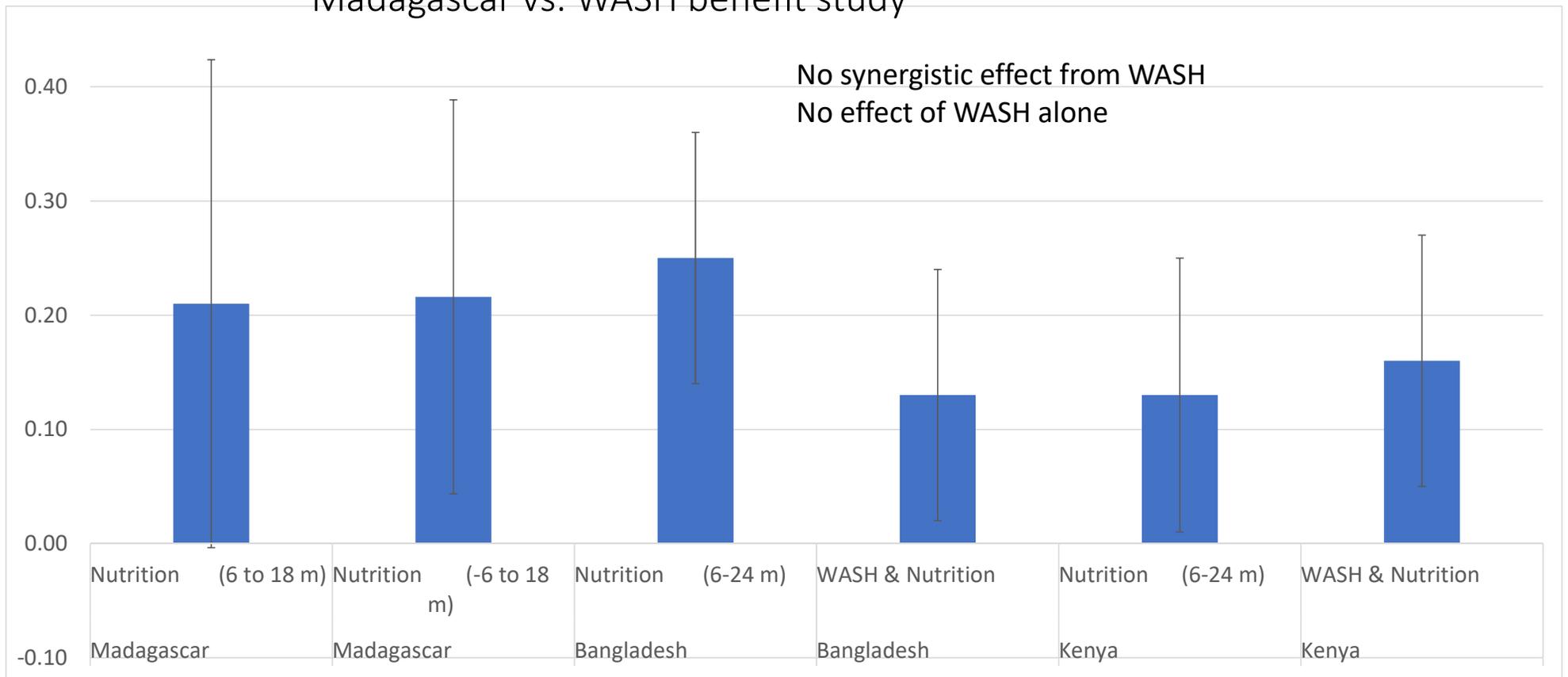
T2: T1+LNS child

T3: T2+LNS P&L

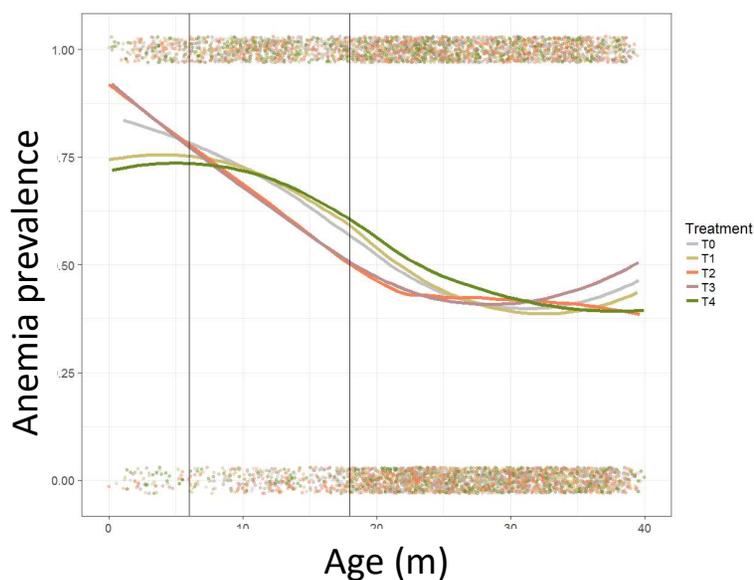
T4: T1+Child stimulation

Comparable effects of LNS for children on height-for-age

Madagascar vs. WASH benefit study



Impact on iron-deficiency anemia



Largest difference in anemia *during* and *for a few months after* LNS supplementation

Biochem. subsample results (youngest cohort: age 18-24 m at endline)

- Significant reductions in
 - Anemia
 - Iron deficiency anemia
- Iron: Similar patterns for ferritin and serum transferrin receptor (~ WASH Benefits and multiple micronutrient studies)
- Vit A: No effect on retinol binding protein

T0: Existing program

T1: T0+ Intensive counseling

T2: T1+LNS child

T3: T2+LNS P&L

T4: T1+Child stimulation

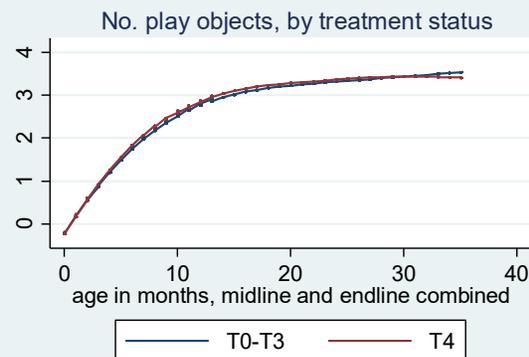
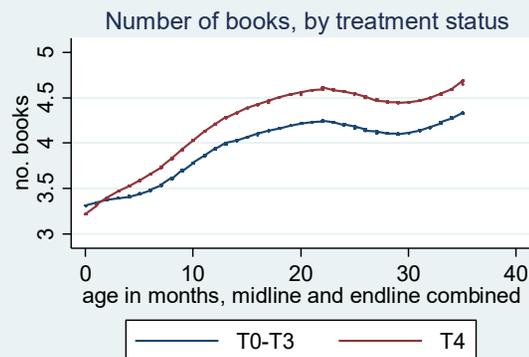
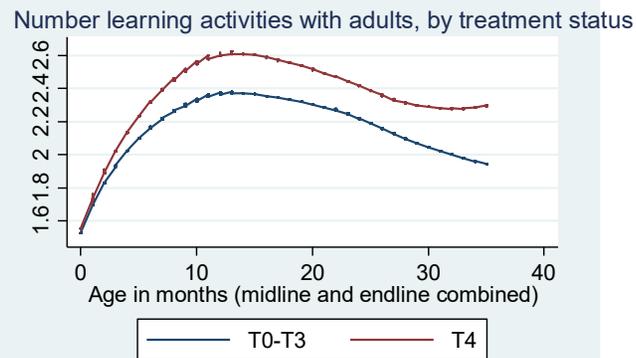
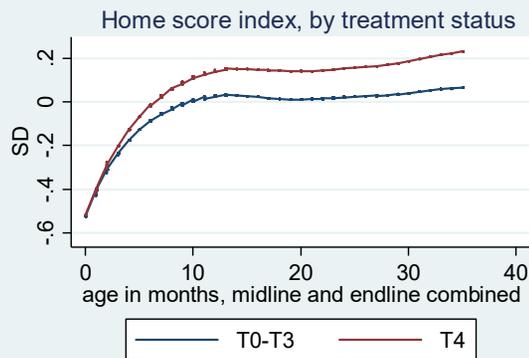
Stewart, Fernald, Weber, Arnold and Galasso "Impact of lipid-based supplementation on child anemia and micronutrient status in Madagascar: a multi-arm cluster randomized controlled trial", *under review*

Effects on dietary behaviors

	Animal Source Food past 24h	Dairy Intake Past 24h	Vitamin A rich food Past 24h	Food diversity score past 24h	Meal frequency Past 24h	Home Score (FCI)
TO	0.231 [0.42]	0.013 [0.11]	0.496 [0.5]	2.748 [0.95]	2.978 [0.67]	0.303 [1.03]

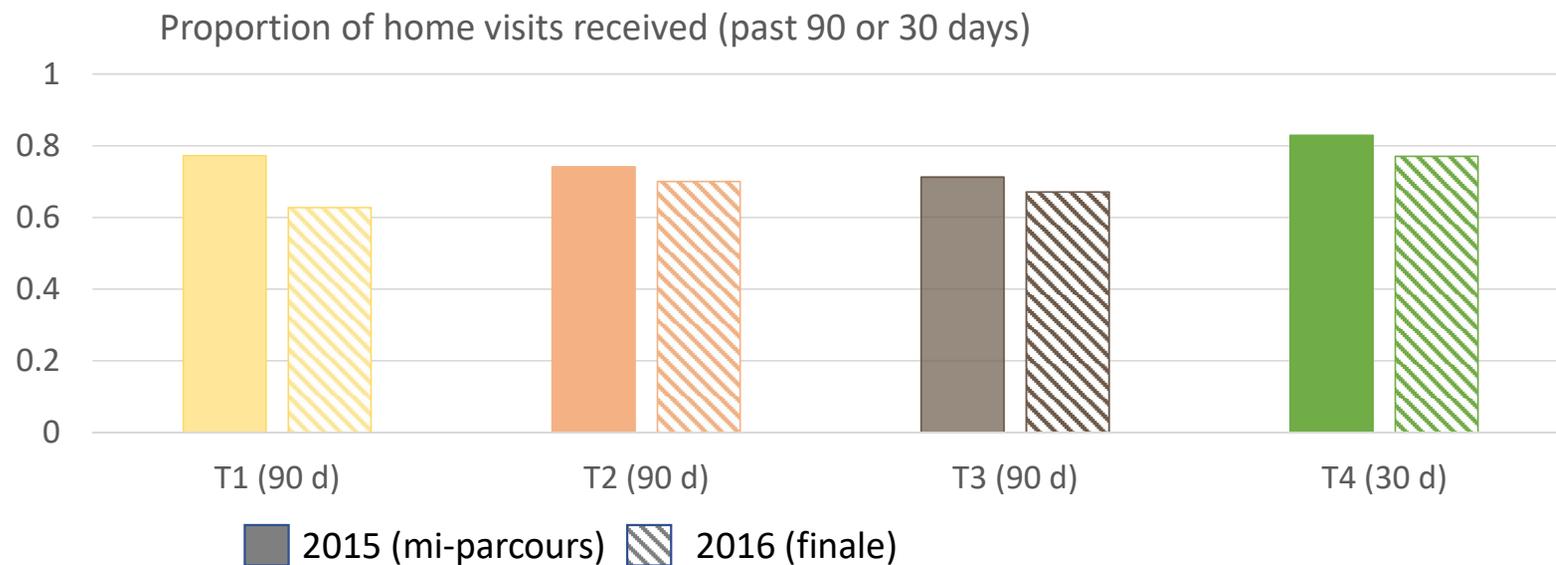
- Significant program (T1-T4) effects on food practices
 - ↑ Animal source food past 24h +8.5 pp
 - ↑ Dairy intake past 24h +2.7 pp
 - ↓ vitamin A rich food past 24h -12.6 pp
 - ↑ meal frequency past 24h +0.126
- No effect on dietary diversity, food security
- No effect on morbidity and home environment

Limited behavioral response to early stimulation



- Home score higher in T4 at midline, but not significant overall sample
- Number of learning activities with adults increases with age up to 12-18 months, then **decreases with age**
- Currently exploring pathways through **mediation analysis**

Fidelity: interventions rolled-out as planned



T1: Overall, about 70% of the households received a visit of the ACDNs in the previous 30 days

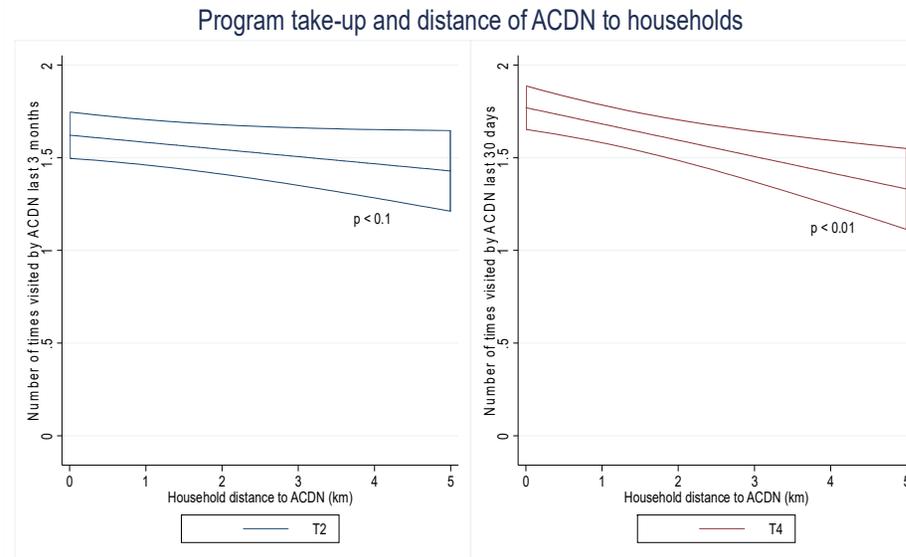
T2: 95% *ever* received LNS kids

T3: pregnant: > 75% lactating moms: >80% *ever* received LNS mo

T4: Overall, 80% households received a home visit for early stimulation

Crowding out and integration?

- No crowding out of home visits community based program
- Behavioral impact on dietary and hygiene practices did not change as a result of the integration of LNS and home visits
- Home visits less likely to reach more isolated households (distance, security)



LNS is cost-effective

- **Benefits:** use the estimated gains from the evaluation for younger cohort: - 8-9pp impact on stunting for young children ~ 12% reduction in stunting
- **Costs:** use unit cost (variable costs) from administrative data
- Adapt framework and parameters as in Galasso, Wagstaff et al (2019)
 - T2 and T3 have sizable internal rates of return (10.7% and 7.9% respectively)
 - T2 dominates T3 (double cost, comparable benefits)

5. Mahay Pilot: Conclusion

Mahay contribution and open questions

Nutrients (direct vs behavior)

Nutrition education less effective in food insecure settings
Proteins/animal source food shown to be key for growth/development

LNS supplementation as part of an integrated health/nutrition package:

- Preventative effect on stunting
- Meta-analysis shows infant mortality effects

Need more longitudinal analysis to look at medium term effects:

- Do health results persist?
- No contemporaneous effect on child development (may be have dynamic effects)

Information vs/with resources

Room to improve nutritional counseling to promote and sustain behavioral change.

Q: Is it a necessary vs sufficient condition?
comparison with cash transfers/SIEF funded studies

Early Stimulation

Home visiting not effective in a very low income setting

- Human resource intensive (coverage and training/coaching)
- Limited behavioral response of households

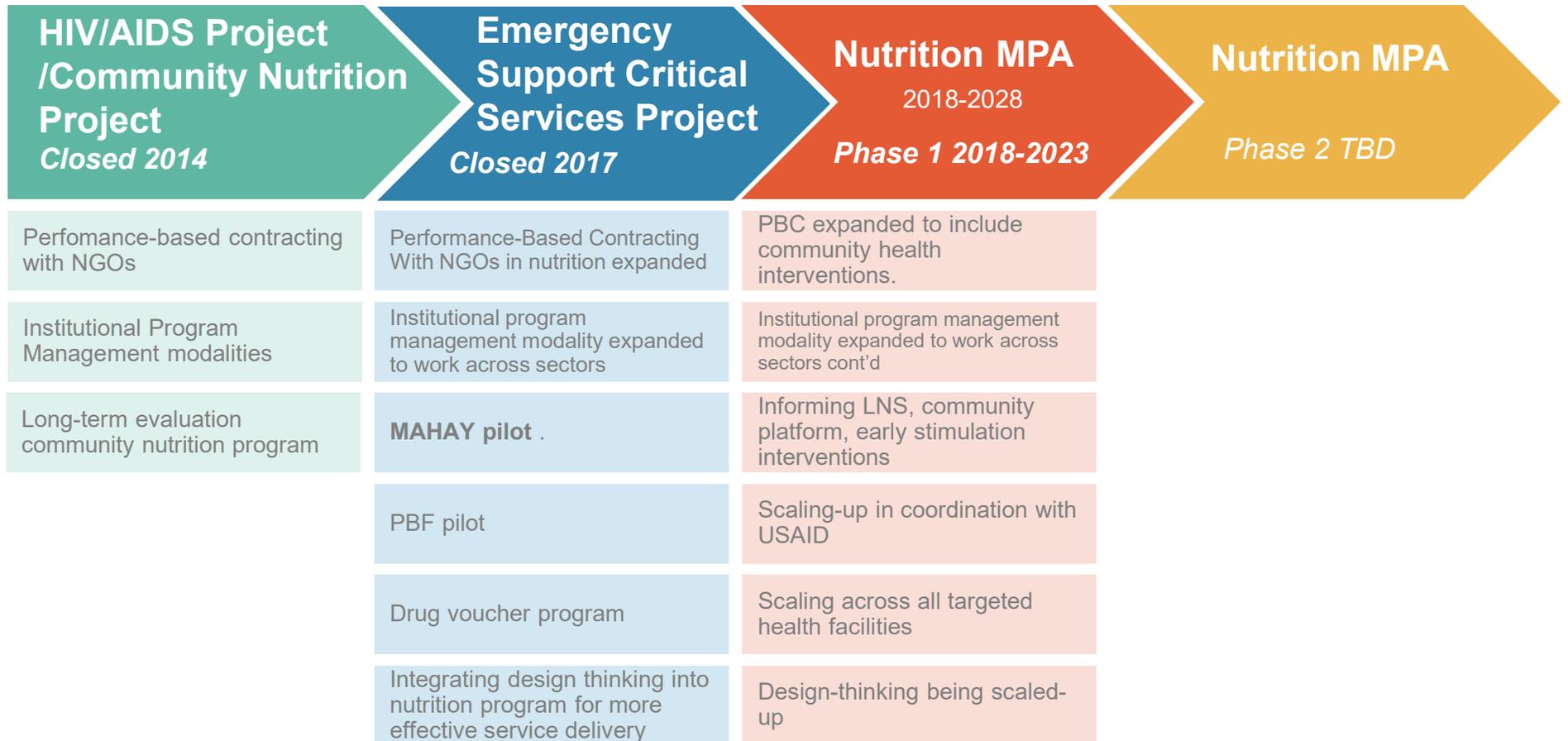
Q: how to elicit and sustain demand for early stimulation?
Framing/awareness importance
Time and mental health for low income households?
What is the value added of materials/books?
Comparison with other group modalities

dynamic effects)

modalities

6. Informing Program Design

Adaptive Learning in the Madagascar HNP Portfolio



MPA: From Research to Implementation

LNS

What did we learn from MAHAY?

- Significant impact on nutritional outcomes among the youngest cohorts
- LNS to children 6-18 cost-effective
- No benefit from supplementing mothers

How translated into the MPA?

- 1st phase 215,000 children. No other program delivering LNS at this scale.
- Targeted to youngest children 6-18 mos.
- Different package for pregnant women
- Local production using MAHAY formula to bring down costs over time
- Gradual scale-up to refine targeting and implementation

Community Platform

What did we learn from MAHAY?

- Messaging helps shift key behaviors
- Barriers to home visiting due to high geographic dispersion

How translated into the MPA?

MAHAY one input into comprehensive redesign of community platform and behavior change interventions:

- Focus on improving group nutrition/health counseling: integrate maternal & child health activities
- Redesign of training, messaging, behavior change interventions (A&T,HCD)
- 1 site : 1 community for community outreach
- Selection, training, supervision, of community health workers

community health workers

Early Stimulation

What did we learn from MAHAY?

- No benefit from home visiting on home environment or child outcomes
- High quality program is human resource intensive (training/coaching)
- Framing activities is key

How is it translated into the MPA?

- Still high demand for early stimulation. Testing feasibility of integrating into **group activities** (content, materials, structured play)
- **Multiple messaging touch points:** integrating basic messages of early stimulation in the training, health cards and IE materials.
- Linkages with SP going forward



Thank you!