Biofortification, crop adoption and health information:

Impact pathways in Mozambique and Uganda

Alan de Brauw[1], Patrick Eozenou[2], Dan Gilligan[1], Christine Hotz[4], Neha Kumar[1], and J.V. Meenakshi[3]

[1]International Food Policy Research Institute

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Outline

Vitamin A Deficiency

- Vitamin A Deficiency (VAD) is a serious health concern in Mozambique and Uganda
- VAD causes increased severity of illness and can lead to blindness
  - “Responsible” for up to 30% of deaths among children under 5 in Mozambique
- Main intervention to combat VAD has been supplementation
  - Per beneficiary supplementation is cheap, but . . .
  - Requires a national campaign, and . . .
  - Coverage is incomplete (in both countries)

REU Project: Biofortification

- Took place between 2006 and 2009 in Zambézia Province, Mozambique, and Uganda
- Used an *integrated* approach to promote OFSP adoption to reduce vitamin A deficiency among mothers and young children
  - Seed Systems Component (Production)
  - Demand Creation Component (Consumption)
  - Market/Product Development Component (Exchange)
- Large research component, many partners

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Objective of Paper

- Understand impacts on major outcome goals: Adoption and Vitamin A Consumption
- Unfortunately, could not randomize in, for example, the consumption component
- Therefore a technique called *causal mechanism analysis* to determine which factors were important in determining:
  - Adoption, and
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Impact Evaluation Design

- Model 1, Model 2, Control Groups
  - Villages were stratified approximately by district in both countries
  - Control group only got vines in 2010 after evaluation component was complete
- Impact Evaluation Surveys
  - Socioeconomic Survey : Included information on household demographics, agriculture, and knowledge gains from program
  - Nutrition Survey: Included 24 hour recall module to measure individual dietary intakes of vitamin A and other nutrients among young children and their mothers

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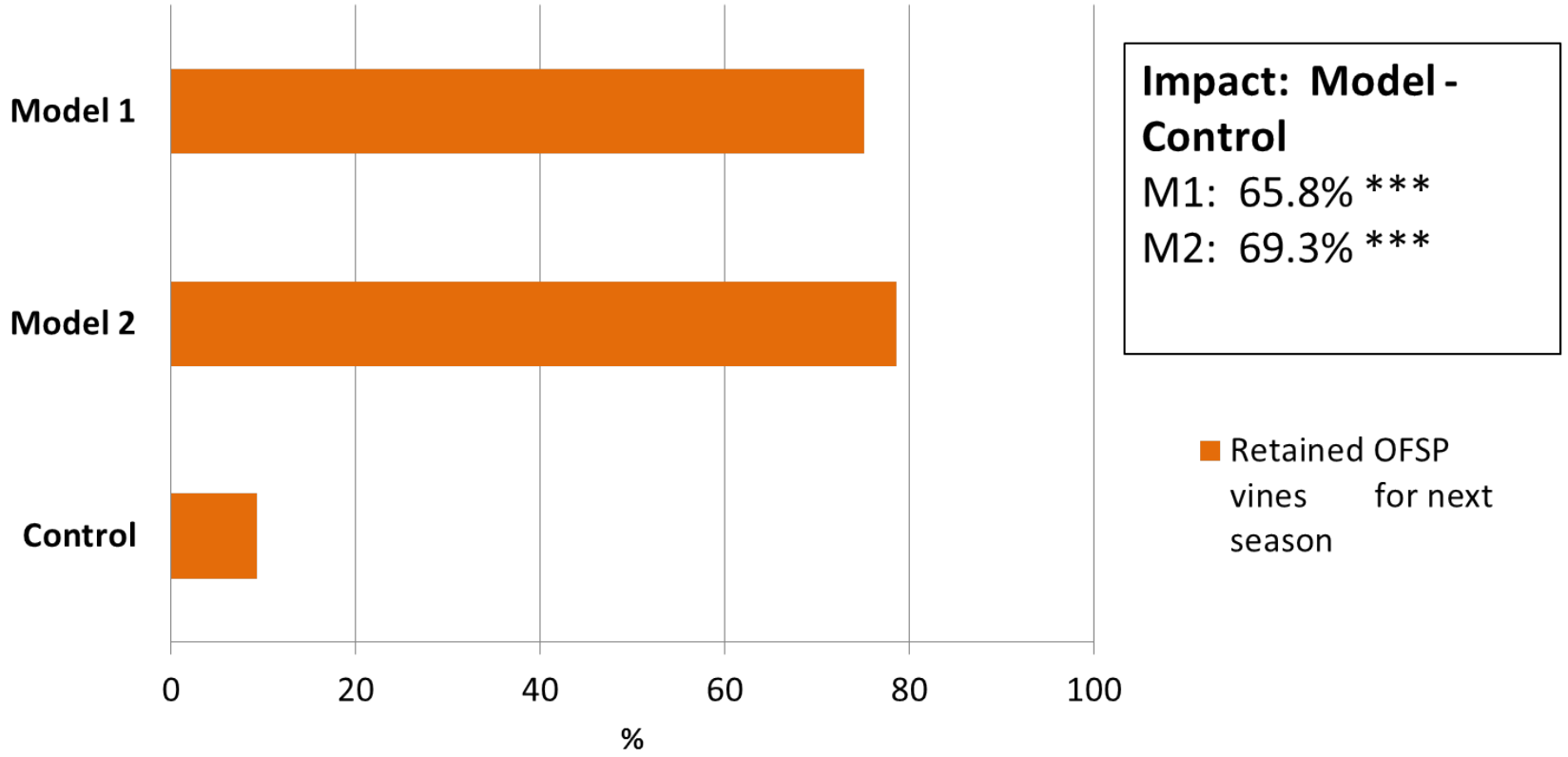
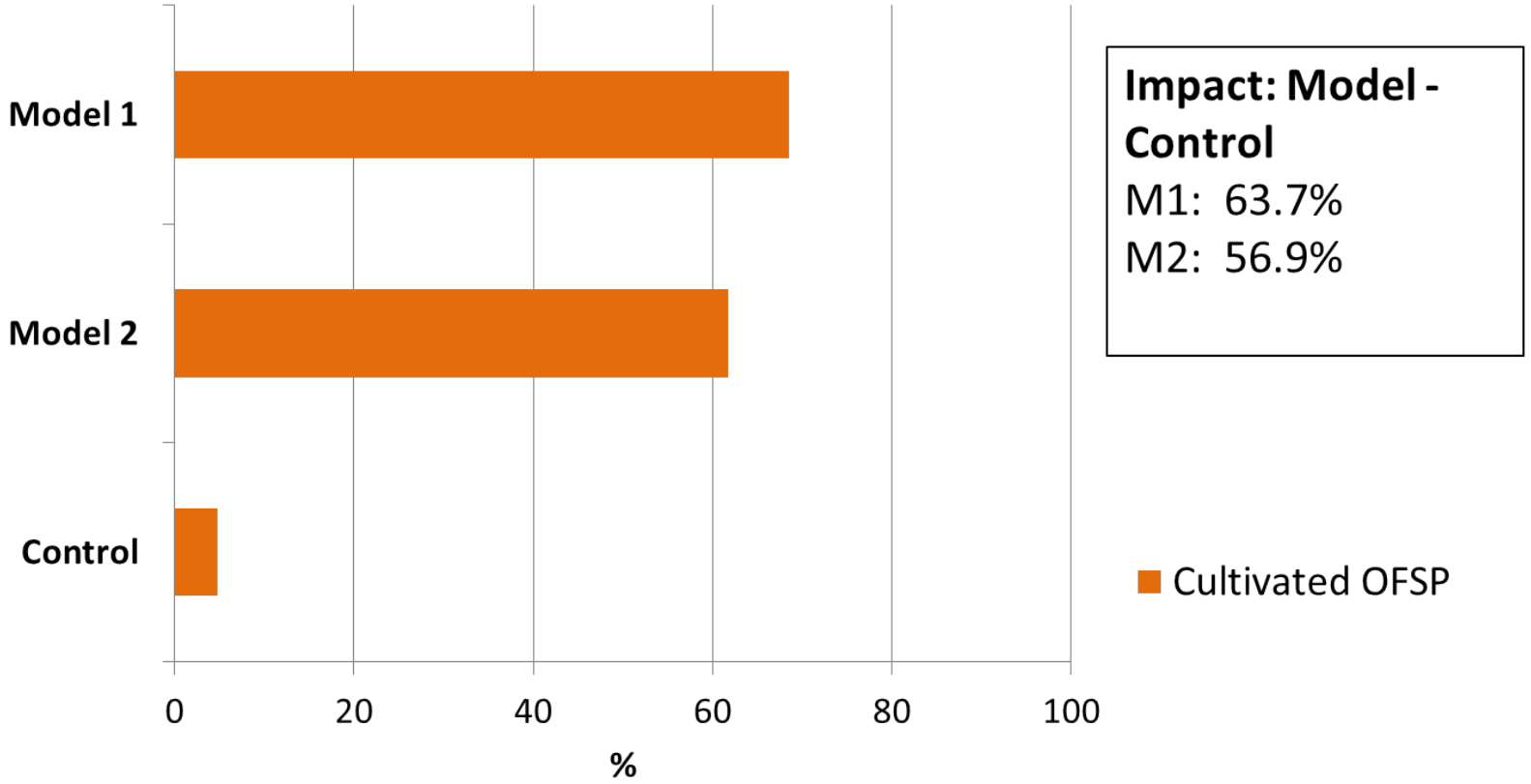
Measures of OFSP Adoption

- Primary measure, Adoption, defined as:
  - In Uganda, whether farmers were growing OFSP in fourth season after receiving vines
  - In Mozambique, answer to question: Do farmers keep vines for 2010?
- Secondary measure (not presented here): Share of OFSP in total area planted in sweet potato

Proportion of Households Adopting OFSP, Mozambique



Proportion of Households Adopting OFSP, Uganda



Summary: Adoption and Nutritional Knowledge

- Large impacts on OFSP adoption
- No difference between Models 1 and 2
- But only modest impacts on knowledge of messages about vitamin A
- Most (almost all) mothers reported knowing of vitamin A at end of project (not shown)
  - Strong impact on mothers knowing that OFSP is a source of vitamin A at endline (30-40% of mothers)

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Impacts: Dietary Intakes

- Main measure: micrograms of vitamin A in diet
  - Computed from foods consumed, which are converted into nutrients
- Can also predict the impact on vitamin A deficiency after controlling for intraday variation in intakes (BLUPs)
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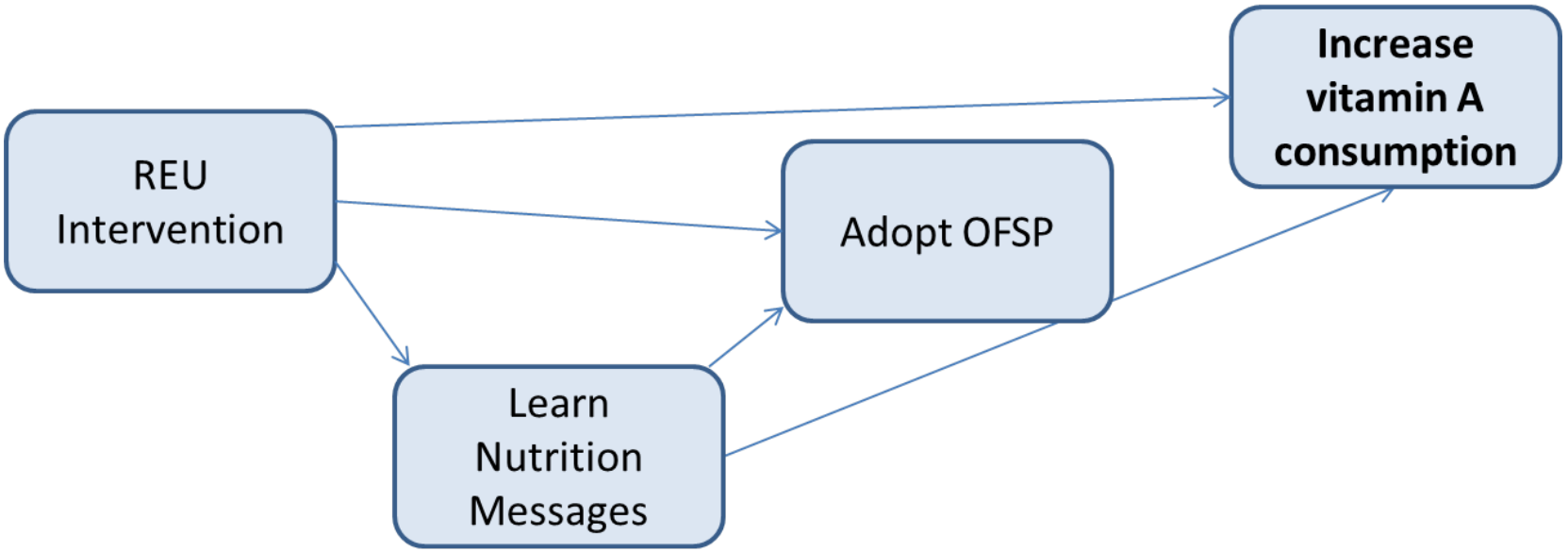
Results: Dietary Intakes, Reference Children

	Mozambique		Uganda	
Group	Impact, DI	Impact, BLUPs	Impact, DI	Impact, BLUPs
Model 1	243.0**	203.8**	308.3**	338.8**
	(85.8)	(35.0)	(148.3)	(38.3)
Model 2	211.8**	208.4**	677.1**	377.5**
	(96.3)	(26.3)	(222.0)	(78.0)
Average	226.0**	206.4**	449.7**	274.7**
	(81.6)	(22.5)	(145.7)	(42.9)

Summary: Impacts on Dietary Intakes

- Average vitamin A consumption increase about the USDA RDA level (210 μg per day)
- But no other significant changes to diet
- Again, no significant differences between Models 1 and 2

Mechanisms


REU Intervention
Adopt OFSP
Learn Nutrition Messages
Increase vitamin A consumption

Estimation

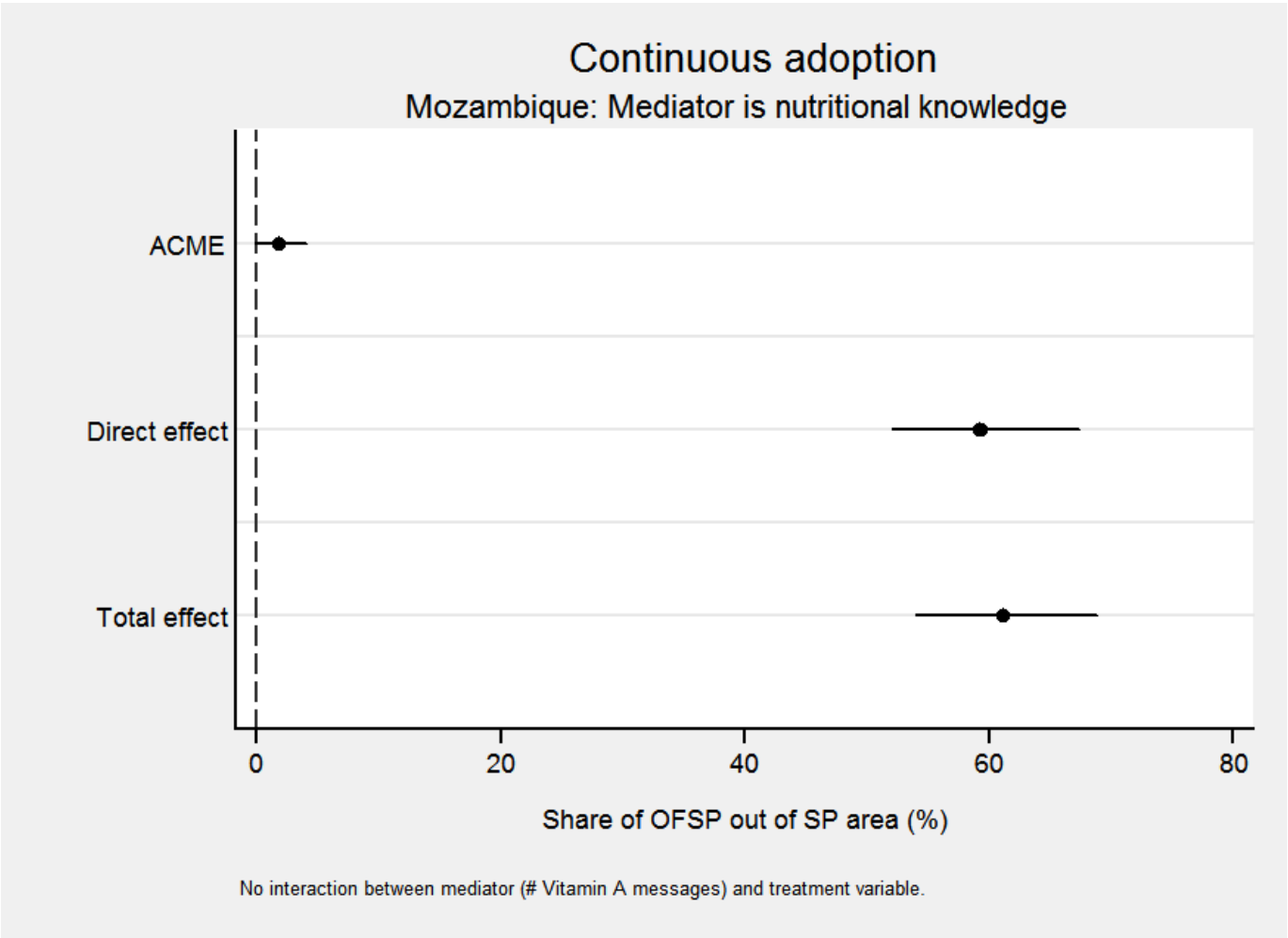
Sequentially estimate two equations of the form (Imai et al., 2011):

$$M_i = \alpha_1 + \beta T_i + \gamma_1 Z_i + u_i$$

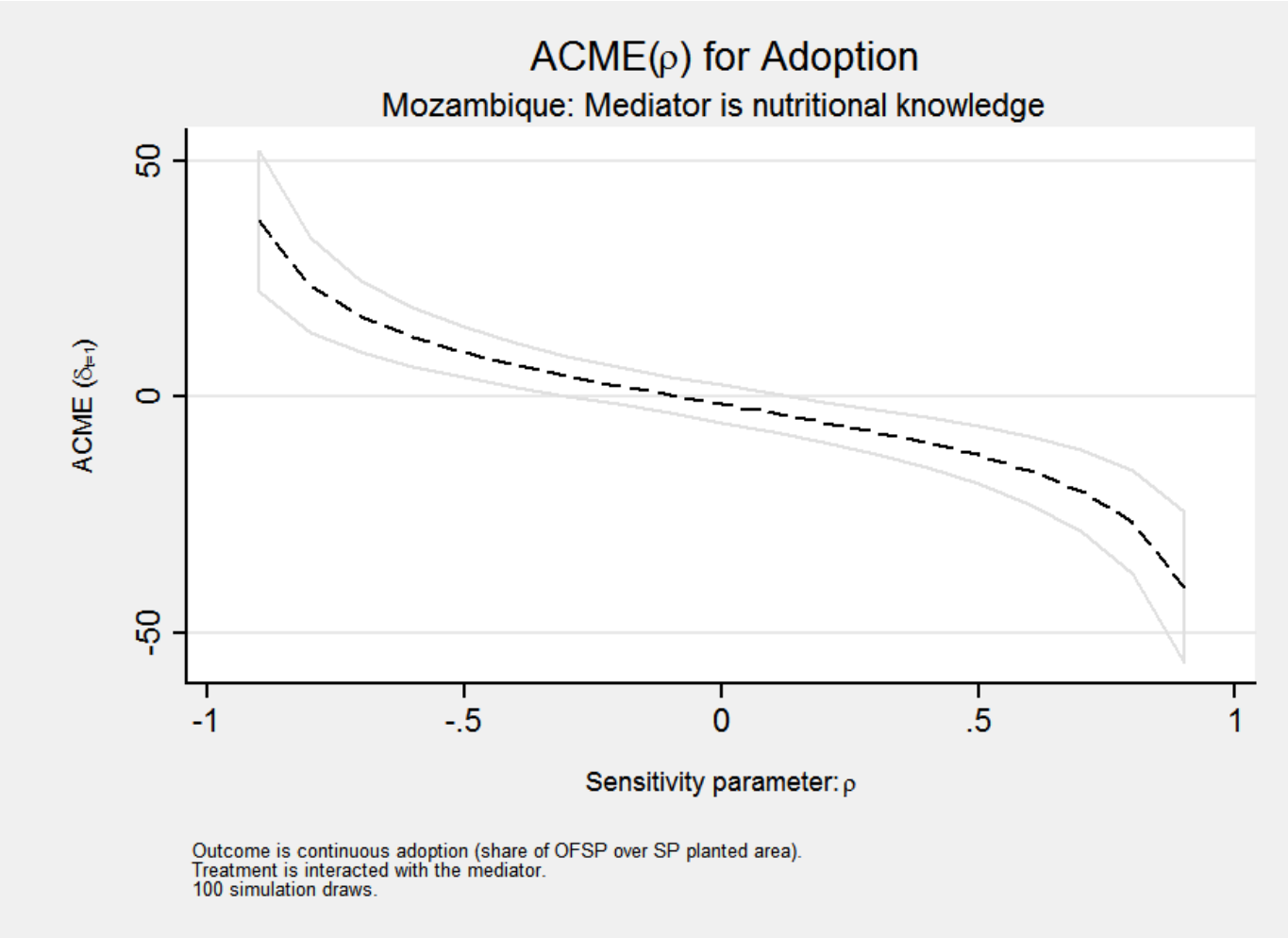
$$A_i = \alpha_2 + \eta T_i + \zeta M_i + \gamma_2 Z_i + \varepsilon_i$$

Under assumptions of *sequential ignorability* and linear effects, $\hat{\beta}\hat{\zeta}$ is the amount of adoption caused by **mediating** variable

Causal Mechanism Analysis: Adoption, Mozambique



Sensitivity Analysis: Adoption, Mozambique



Summary

- Uganda results are very similar, so . . .
- Measures of vitamin A messages have little (if any) effect on adoption
- Only way this finding might not be true- if there is strong negative correlation between error terms

Causal Mechanism Analysis, Vitamin A Intakes, Reference Children

	Mozambique		Uganda	
	(1)	(2)	(3)	(4)
ACME, Adoption	190.3**	189.7**	201.1**	192.7*
	(61.1)	(62.3)	(99.6)	(97.0)
ACME, Vitamin A		14.1		58.6*
		(26.2)		(34.2)
ADE	−2.16	−15.7	219.4	169.7
	(107.8)	(108.7)	(188.3)	(189.6)

Summary: Causal Mechanism Results

- We find that demand creation messages – narrowly defined– did not affect adoption or consumption
- Adoption behavior largely explains the amount of vitamin A consumed by young children, whether or not they are reference children
- Some unexplained variation in Uganda r.e. dietary intakes– could be general health messages of project

Conclusion

- Large impacts of project, but no differences in impacts between Models 1 and 2 (heavy and light treatments)
- Little adoption attributable to detailed nutrition messages
- So hypothetical scale up of Model 2 could eliminate marketing component, scale back demand creation with little effect on primary impacts (vitamin A consumption)
- Can decrease costs substantially in hypothetical scale-up (larger reductions in Uganda than in Mozambique)