Household food production and child diet diversity in Nepal: The role of child age and family wealth

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What is the link between a family's food production and their child's diet quality?

- **There is now a large literature showing a positive link between what farm families grow and what their children consume**
  - Especially for *more remote* households, further from food markets, who are more reliant on own production (e.g. Shibatu et al., 2015)

- **We use two rounds of PoSHAN survey data (2013 & 2014) to test two key hypotheses about *how* and *for whom* production is linked to intake:**

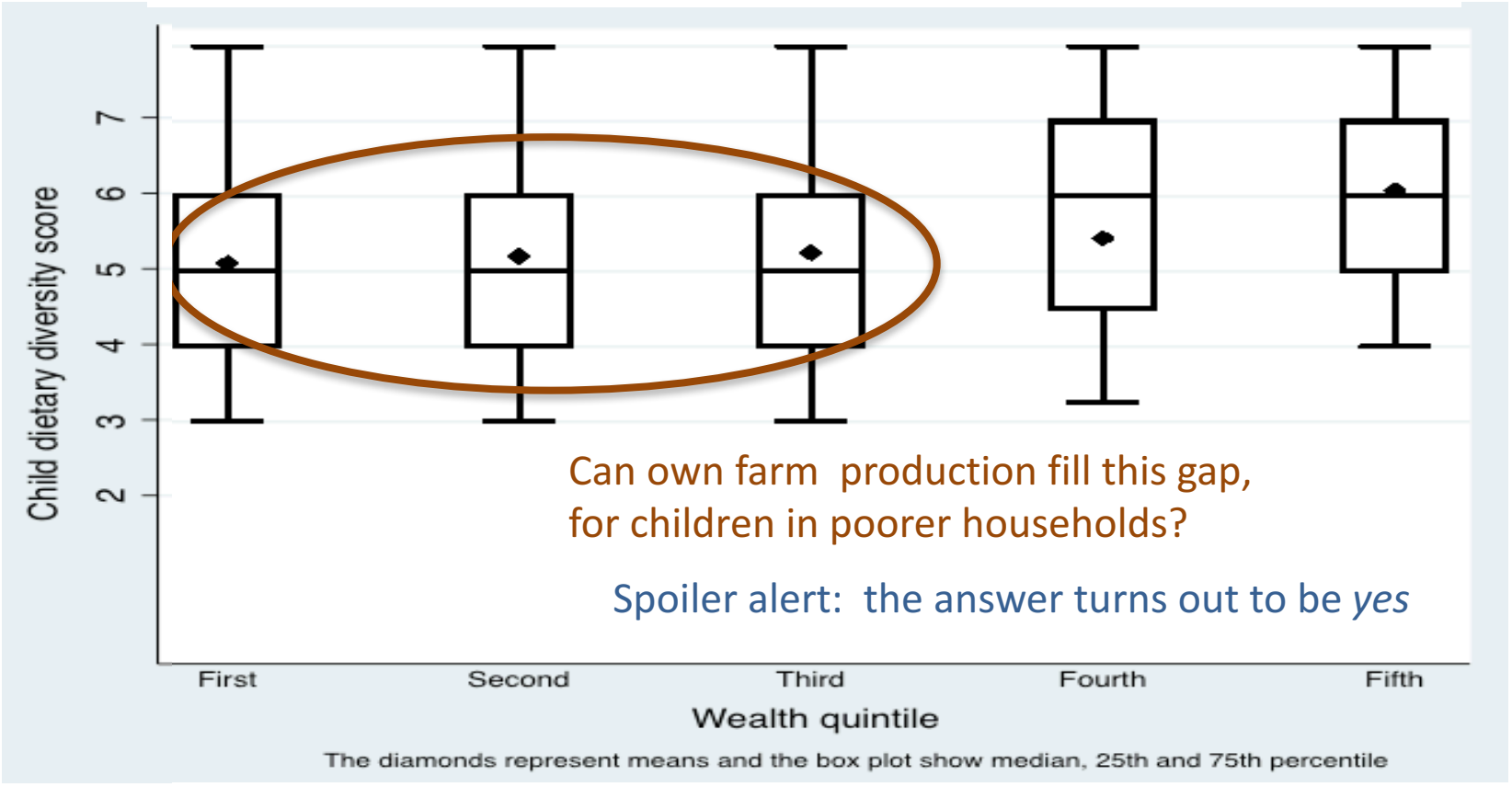
  1) Is farm production linked to intake only for *older* children?
  Older children can consume the family diet, whereas infant feeding requires special care

  2) Is farm production linked to intake only for *poorer* households?
  Poorer families may depend on their own farm, whereas richer ones can buy childrens' food

- **Outcomes are**
  - Diet diversity: whether child consumes ≥ 4 of 7 food groups
  - Individual food groups: whether child consumes that food group

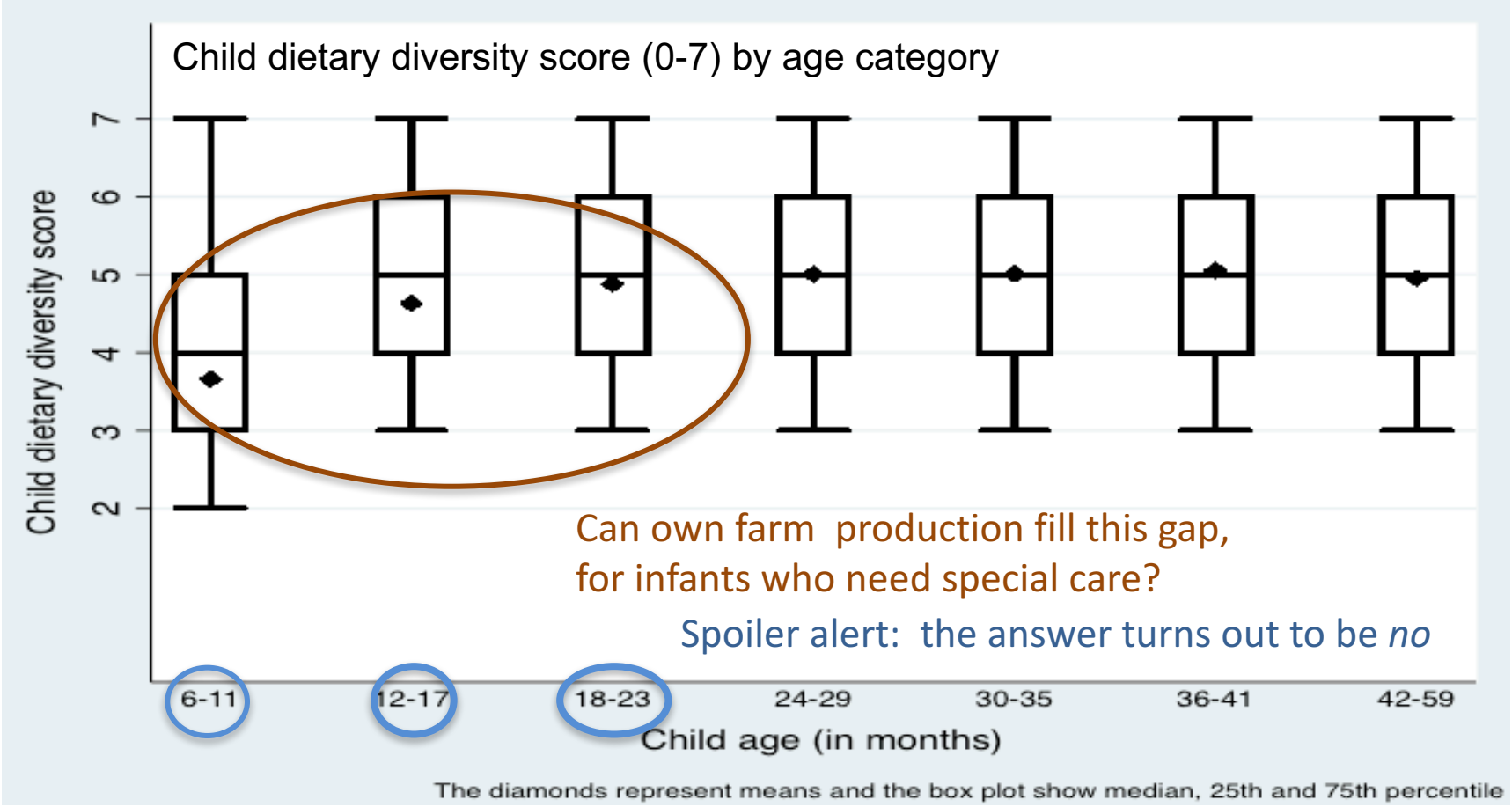
Does farm production raise intake only for the poor, as their lack of cash constrains access to markets?

Child dietary diversity score (0-7) by wealth quintile



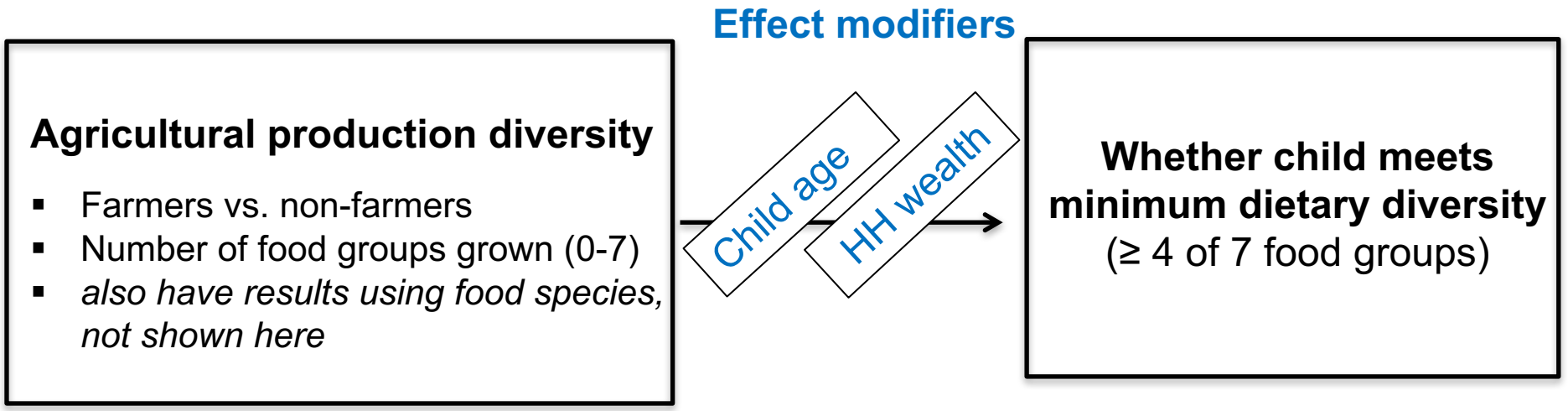
Dataset: Policy and Science of Health, Agriculture, and Nutrition (PoSHAN) 2013 and 2014

Does farm production raise intake only for older children, as they can consume the same as other family members?

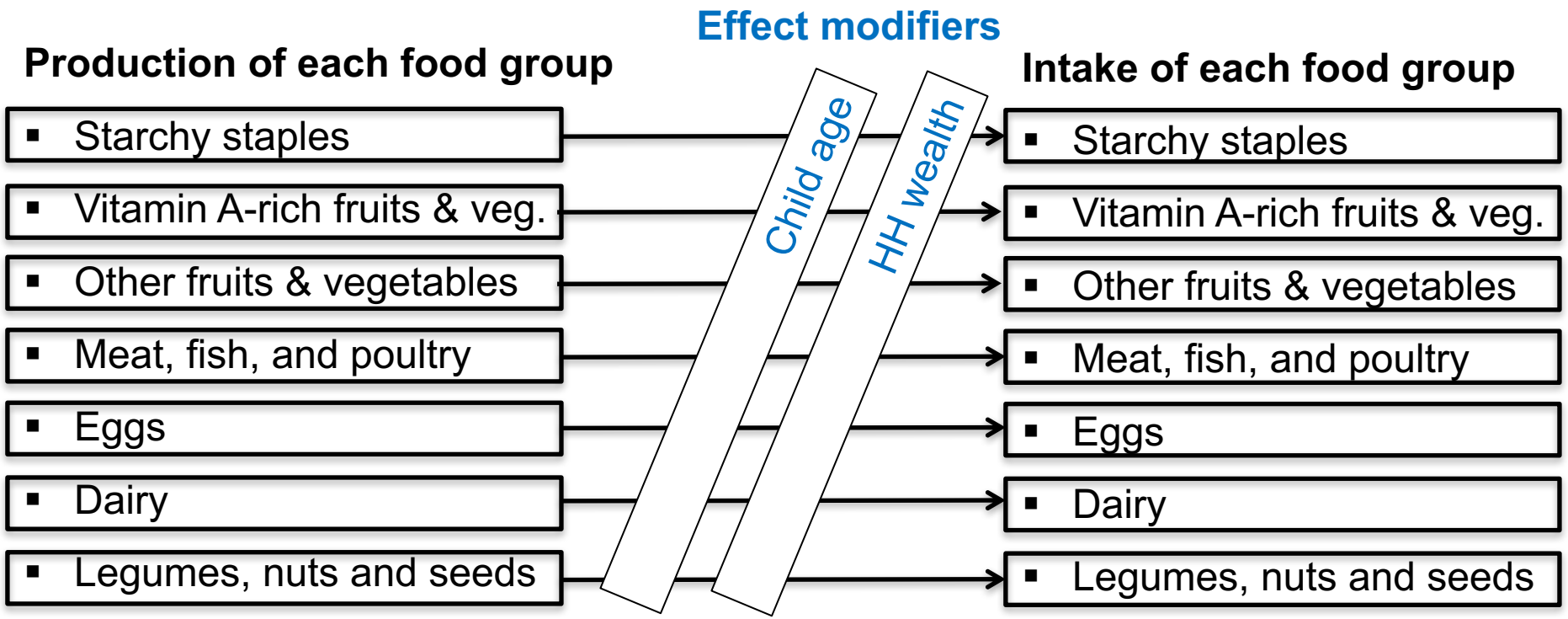


Dataset: Policy and Science of Health, Agriculture, and Nutrition (PoSHAN) 2013 and 2014

How is production diversity linked to diet diversity?



How is production *of each group* linked to dietary intake of that group?



How is production diversity linked to diet diversity?

Statistical test:
Logit with VDC and year fixed effects

$$MDDC_i = B_0 + B_1\, farmdiv_{ih} + B_2\, wealth_{ih} + B_3\, farmdiv_{ih}\ X\ wealth_{ih} + \delta\, Z_i + \alpha\, VDC_i + \gamma\, year + \mu_i$$

Outcome Variable:
Whether child meets minimum dietary diversity (≥4)

Farm production predictor variable:
- Food groups grown (0-7)
- Agricultural diversity quintile (0-5)
- Farmers vs. non-farmers (0 or 1)

Mediating variable:
Wealth quintile (1-5)

Interaction term
to test for mediation

Control variables:
- *Maternal*: Age, education, BMI
- *Household*: Caste, religion, land owned/rented
- *Child:* Sex, whether breastfed
- *Geography:* Altitude, ecological zone

VDC and year fixed effects
to absorb other characteristics of each place and time

How is production *of each group* linked to dietary intake of that group?

Statistical test:
Logit with VDC and year fixed effects

$$Cnsmptn'_{ih} = B_0 + B_1\, prdctn'_{ih} + B_2\, wealth_{ih} + B_3\, prdctn'_{ih}\, X\, wealth_{ih} + \delta\, Z_i + \alpha\, VDC_i + \gamma\, year + \mu_i$$

Outcome Variable:
Consumption of each individual food group (from 1 to 7)

Farm production predictor variable:
- Production of that same food group (from 1 to 7)

Mediating variable:
Wealth quintile (1-5)

Interaction term
to test for mediation

Control variables:
- *Maternal*: Age, education, BMI
- *Household*: Caste, religion, land owned/rented
- *Child:* Sex, whether breastfed
- *Geography:* Altitude, ecological zone

VDC and year fixed effects

Household food production diversity is positively associated with child dietary diversity for older children in poorer households

	(1)	(2)	(3)	(4)	(5)
	MDDC ≥4 6-11 mo.	MDDC ≥4 12-17 mo.	MDDC ≥4 18-23 mo.	MDDC ≥4 6-23 mo.	MDDC ≥4 24-59 mo.
Number of food groups grown (0-7)	0.183 (0.17)	-0.086 (0.20)	0.430*** (0.13)	0.139 (0.10)	0.253*** (0.09)
Quintile of household wealth (1-5)	0.218 (0.31)	-0.034 (0.34)	0.786*** (0.20)	0.232 (0.18)	0.497*** (0.19)
Wealth X number of groups grown	-0.037 (0.05)	0.088 (0.07)	-0.137*** (0.04)	-0.030 (0.02)	-0.039 (0.03)
Controls	Yes	Yes	Yes	Yes	Yes
VDC & year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	396	399	800	1,635	4,343

Notes. Unit of observation is an individual child between 6-59 months. Standard errors in parentheses, clustered on VDCs. All results are from weighted logit regressions with fixed effects for each of 21 VDCs and 2 years. Survey weights are used for children in the balanced panel, in which each child is observed twice. The weights are 0.537 for Mountain, 1.711 for Hill and 0.834 for Terai.
*** p<0.01, ** p<0.05, * p<0.1

Results hold with the larger, unbalanced sample

	(1)	(2)	(3)	(4)	(5)
	MDDC ≥4 6-11 mo.	MDDC ≥4 12-17 mo.	MDDC ≥4 18-23 mo.	MDDC ≥4 6-23 mo.	MDDC ≥4 24-59 mo.
Number of food groups grown (0-7)	0.083 (0.09)	-0.131 (0.13)	0.335** (0.10)	0.052 (0.07)	0.166** (0.08)
Quintile of household wealth (1-5)	0.211* (0.12)	-0.070 (0.21)	0.559*** (0.21)	0.160 (0.11)	0.369** (0.18)
Wealth X number of groups grown	-0.031 (0.03)	0.093** (0.04)	-0.096*** (0.03)	-0.007 (0.02)	-0.011 (0.03)
Controls	Yes	Yes	Yes	Yes	Yes
VDC & year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	1,034	934	1,040	3,033	6,213

Notes. Unit of observation is an individual child between 6-59 months. Standard errors in parentheses, clustered on VDCs. All results are from weighted logit regressions with fixed effects for each of 21 VDCs and 2 years. Survey weights are used for children in the unbalanced panel. The weights are 0.449 and 0.504 for Mountain, 1.730 and 1.714 for Hill and 0.871 and 0.847 for Terai for panel 1 and 2, respectively. *** p<0.01, ** p<0.05, * p<0.1

The link between farm production and child intake holds only for some food groups

Coefficients on the association between individual food group production & consumption mediated by child age

Production of:	6-11 mo. (cons.)	12-17 mo. (cons.)	18-23 mo. (cons.)	6-23 mo. (cons.)	24-59 mo. (cons.)
Vitamin A-rich F&V	0.71	0.61	1.24***	0.98***	0.45
Other F&V	1.16	0.50	0.73	0.56	1.08***
Meat	1.83	-1.76	0.87	0.12	0.21
Eggs	0.78	0.22	1.64***	1.32***	0.98***
Dairy	-1.71***	-0.49	0.98***	0.06	1.20***
Legumes, nuts & seeds	0.08	0.47	-0.36	0.03	0.63
Observations	396	399	800	1,635	4,343

Notes. Unit of observation is an individual child between 6-59 months.. All results are from weighted logit regressions with fixed effects for each of 21 VDCs and 2 years. Survey weights are used for children in the balanced panel. The weights are 0.537 for Mountain, 1.711 for Hill and 0.834 for Terai. *** p<0.01, ** p<0.05, * p<0.1

The link between home production and intake holds only for specific food groups, among older and poorer children

	6-11 mo. (cons.)	12-17 mo. (cons.)	18-23 mo. (cons.)	6-23 mo. (cons.)	24-59 mo. (cons.)
Vitamin A-rich F&V					
HH produces this group	0.71	0.61	1.24***	0.98***	0.44
HH wealth	0.09	0.16	0.18*	0.15	1.20**
HH prod. X wealth	-0.20	-0.09	-0.27*	-0.21**	-0.15*
Other Fruits & Vegetables					
HH produces this group	1.16	0.50	0.73	0.57	1.08***
HH wealth	0.15	0.23	0.10	0.07	0.09
HH prod. X wealth	-0.26	-0.19	-0.19	-0.12	-0.24*
Observations	396	399	800	1,635	4,343

Notes: Coefficients not significantly different from zero are not shown, and coefficients on control variables are also omitted. Unit of observation is an individual child between 6-59 months.. All results are from weighted logit regressions with fixed effects for each of 21 VDCs and 2 years. Survey weights are used for children in the balanced panel. The weights are 0.537 for Mountain, 1.711 for Hill and 0.834 for Terai. *** p<0.01, ** p<0.05, * p<0.1

The link between home production and intake holds only for specific food groups, among older and poorer children

	6-11 mo. (cons.)	12-17 mo. (cons.)	18-23 mo. (cons.)	6-23 mo. (cons.)	24-59 mo. (cons.)
Dairy					
HH produces this group	-1.71***	-0.49	0.98***	0.05	1.23***
HH wealth	-0.27*	-0.02	0.36***	0.11	0.42***
HH prod. X wealth	0.53***	0.21	-0.28**	0.01	-0.26***
Eggs					
HH produces this group	0.78	0.22	1.64***	1.32***	0.98***
HH wealth	0.68***	0.37**	0.15*	0.27***	0.21***
HH prod. X wealth	-0.07	0.25	-0.13	-0.13	-0.10
Observations	396	399	800	1,635	4,343

Notes: Coefficients not significantly different from zero are not shown, and coefficients on control variables are also omitted. For dairy, anomalous results for 6-11 month old are also omitted. Unit of observation is an individual child between 6-59 months.. All results are from weighted logit regressions with fixed effects for each of 21 VDCs and 2 years. Survey weights are used for children in the balanced panel. The weights are 0.537 for Mountain, 1.711 for Hill and 0.834 for Terai. *** p<0.01, ** p<0.05, * p<0.1

Summary of findings

Agricultural production diversity and child dietary diversity is:

- Positively associated but only for older children (18 or 24 mo.)
- Positively associated but in poorer households (lowest one or two quintiles)

Individual food group production and consumption is:

- Positively associated for older children at all levels of wealth only for eggs
- Positively associated for older children at lower levels of wealth for fruits and vegetables, and dairy

Implications of the findings

- Farm-diversifying programs aimed at improving child dietary diversity will likely see benefits only after 18 months of age
- Improving dietary quality of younger children will require other kinds of complementary feeding interventions
- For older children, maximum benefits of these interventions can be seen when poorer households that are further from markets are targeted
- Except for eggs, production of food groups such as fruits and vegetables and dairy and its consumption are mediated by wealth