

Household agricultural production diversity is associated with increased child dietary diversity through perceived access to a range of foods in Eastern Uganda

Tina Bonde Sørensen, Kate Wellard, Joweria Namboozie, Andrea Bulungu, Lora Forsythe, Pamela Katic, Gwen Varley and Elaine Ferguson

Tina Bonde Sørensen, PhD

tinabondesoerensen@gmail.com

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Introduction

- In Uganda, 27% of children under 5 years are stunted and 10% are wasted (DHS 2016). Only 15% of children aged 6-23 months have a minimum acceptable diet (UBOS 2016)
- Agricultural programmes in Uganda and elsewhere to date have generally focused on increasing the quantity of food produced (adequate calories) rather than quality (nutrition composition)
- Agriculture may affect child nutrition through multiple pathways (Gillespie et al., 2012):
 1. Production of nutritious foods for household consumption
 2. Sale of produce and subsequent food for health expenditure
 3. Women's empowerment via changes in socioeconomic status, time use and agency
- Increased agricultural production diversity has been associated with increased dietary diversity in LMIC, however the evidence is mixed (Pellegrini and Tasciotti, 2014; Sibhatu et al., 2015; Kumar et al., 2015; Jones, 2016, 2017; Kissoly et al., 2020)
- Competing pathways may contribute to these mixed results e.g. positive associations of food production for household consumption may be negated by increased agricultural labour demands that may reduce women's time available for acquiring and preparing diverse foods to feed young children



Study objectives

1. To determine if increased household agricultural production diversity (PD) is associated with child dietary diversity (CDD) in an agricultural community in Eastern Uganda
2. To determine the extent to which women's time in agriculture and women's perceived access to food groups mediate the association

Data collection

- Cross-sectional study
- January and February 2018 (post harvest season)
- 20 villages in Kamuli and Bugiri districts, Eastern Region, Uganda
- Women with a 12-23-month-old child
- Semi-structured questionnaire data
 - Household food production
 - Personal food environment
 - Abbreviated Women's Empowerment in Agriculture Index (A-WEAI)
 - Socio-demographic and health
- Direct observation (6 am-9 pm)
 - Woman's time use in agriculture
 - Child's weighed food record



Women’s perceived access to food groups score

Food group Accessibility score

- 1



1 = very inaccessible
 2 = somewhat accessible
 3 = very accessible
- 2


- 3


- 4


- 5


- 6


- 7



Women’s perceived access to food groups score
 = ∑ accessibility score of 7 food groups (range 7 to 21)

Child dietary diversity and HH agricultural production diversity

Table 2 Food groups used to derive child dietary diversity score, household agricultural production diversity score and women’s perceived access to food groups score

Food group	Description of food group	Individual foods included in food groups
1	Starchy staples (cereals; white tubers and roots)	Corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (for example, bread, noodles, porridge or other grain products) + local foods and other locally available grains White potatoes, white yams, white cassava, or other foods made from roots
2	Vitamin A rich plant foods	Pumpkin, carrots, squash, or sweet potatoes that are orange inside + other locally available vitamin-A rich vegetables (for example, red sweet pepper) Dark green/leafy vegetables, including wild ones + locally available vitamin-A rich leaves such as amaranth, cassava leaves, kale, spinach, etc. Ripe mangoes, cantaloupe, apricots (fresh or dried), ripe papaya, dried peaches + other locally available vitamin A-rich fruits
3	Other fruits and vegetables	Other vegetables (for example, tomato, onion, eggplant), including wild vegetables Other fruits, including wild fruits
4	Meat, poultry, fish and seafood	Liver, kidney, heart or other organ meats or blood-based foods Beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds Fresh or dried fish or shellfish
5	Eggs	Chicken, duck, guinea hen or any other egg
6	Legumes, pluses, nuts and seeds	Beans, peas, lentils, nuts, seeds or foods made from these
7	Milk and milk products	Milk, cheese, yogurt or other milk products

Women's time use in agriculture

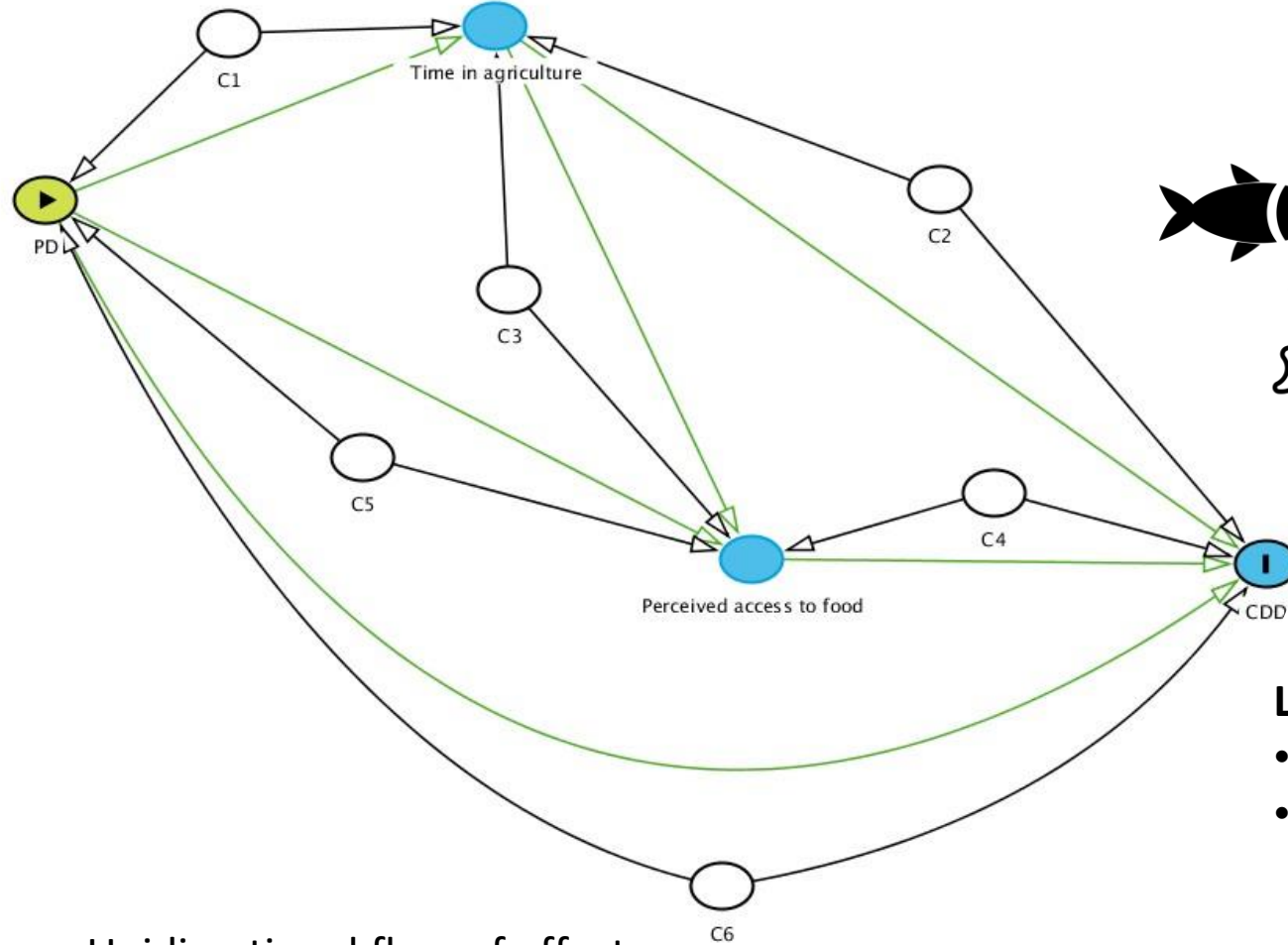
Sum of observed agricultural activities during 15 min intervals from approximately 6 am to 9 pm

Table 1 Productive activities recorded during one-day direct observations

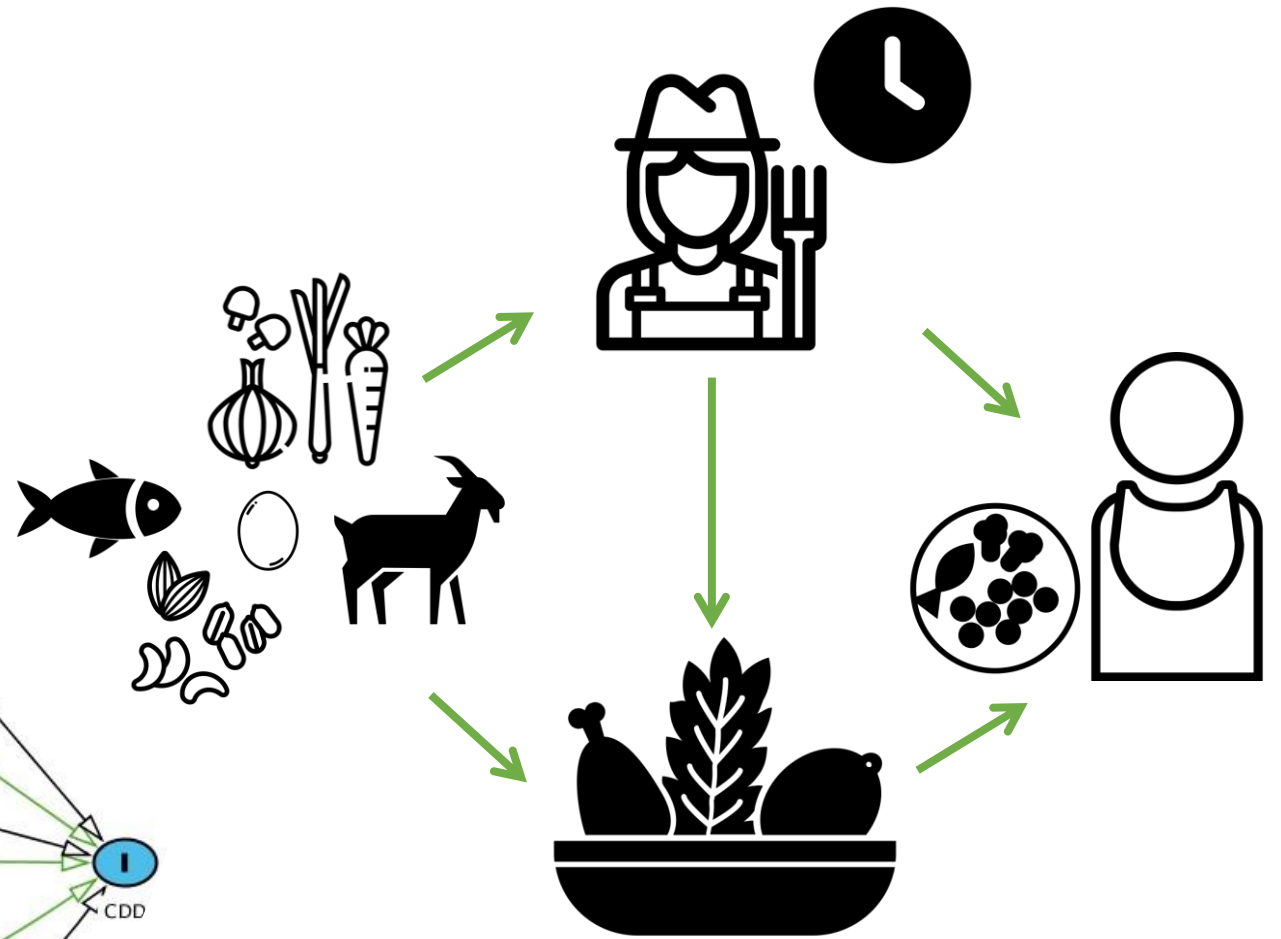
Type of activity	Prespecified activity
Agricultural work	Shelling maize by hand
	Shelling maize using machine
	Other post-harvest processing
	Fish-livestock product processing
	Food crop farming
	Cash crop farming
	Livestock production
	Fish farming
Non-agricultural work	Cooking food (business)
	Working (employed)
	Working (own business)
	Supervising employees



Identification of causal web & Directed Acyclic Graph



- Unidirectional flow of effect
- No unmeasured confounders



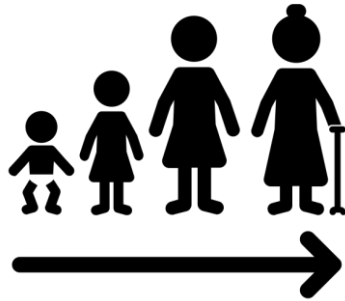
Linear Structural Equation Model

- *a priori* identified covariates
- Included *a priori* identified interactions (empowered in the agricultural time domain; deprivation status) with mediators to improve model specification
- Not powered to stratify the full analysis

Sample characteristics



211 women-child dyads



25 years (IQR 21, 30)
6 % < 18 years



77.8 %



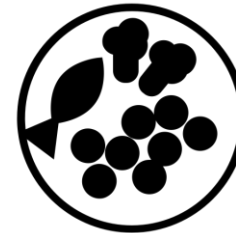
Primary (68.6 %) or
tertiary (25.1 %) education



46.7 % girls

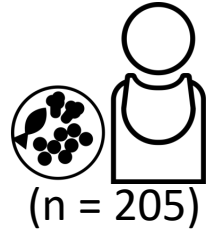


17.3 months (sd 3.1)

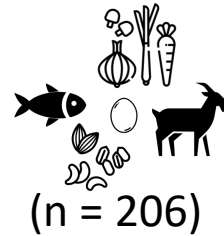


76.1 % children had usual food
intake at the time of survey

Results -CDD,
PD, time use
and perceived
access to food
groups



Range: 1 to 6 food groups
Average 3.6 (sd 0.9) food groups



Range: 1 to 7 food groups during previous year
Average: 4.9 food groups (sd 1.4)



Range: 0 to 375 minutes in agriculture per day
Average: of 30 minutes per day (IQR 0 to 90)



Perceived access
n=200

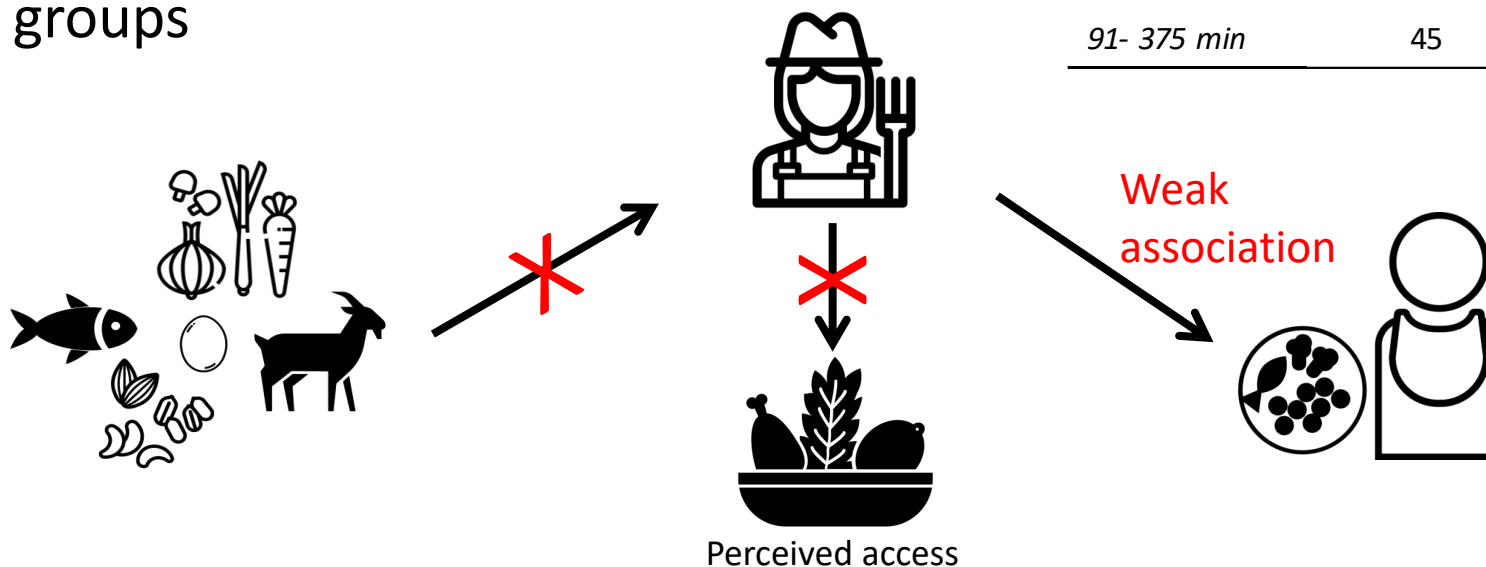
Range: 7 to 21 (unitless)
Average: of 15.6 (sd 4.6)

PD – CDD mediation by women's time use?

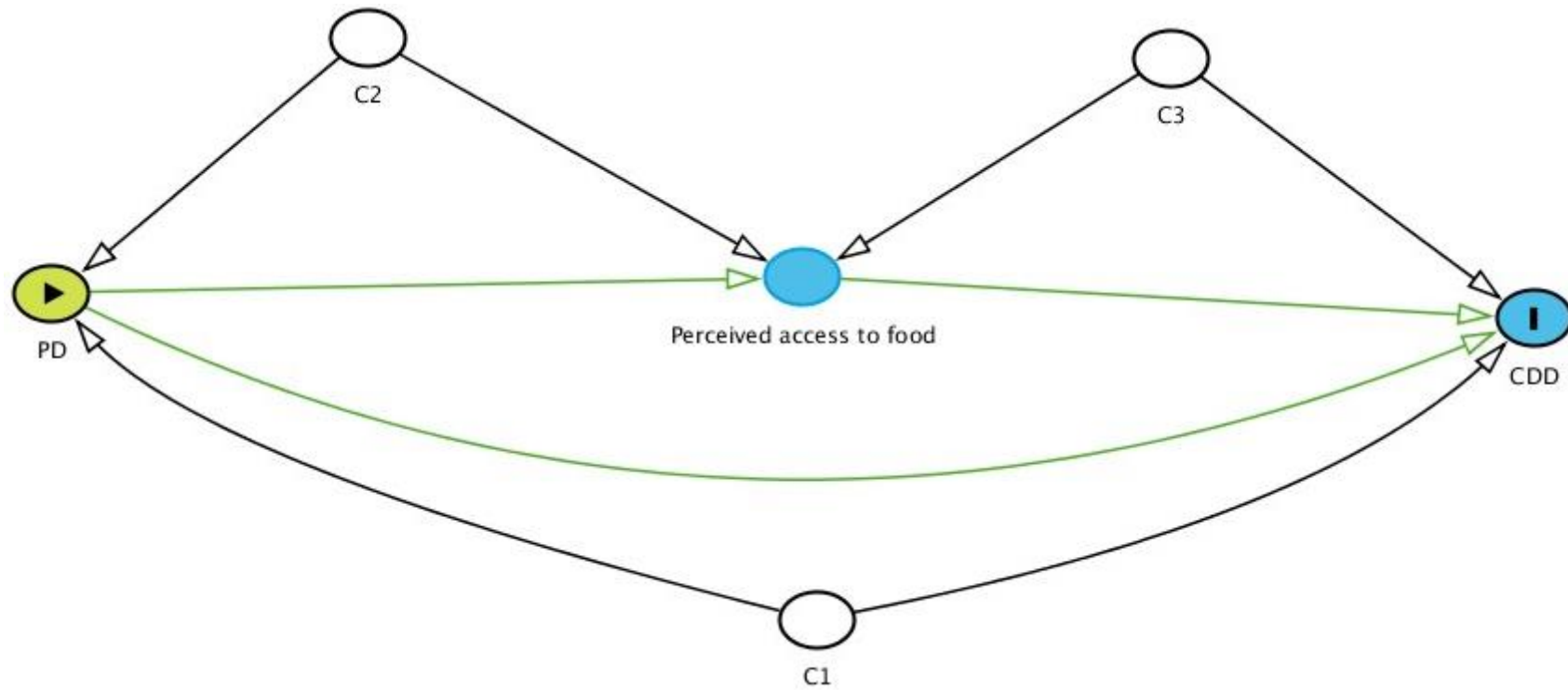
Contrary to our hypothesis

- women who produced a greater number of food groups (higher PD) did not spend more time in agriculture
- the amount of time spent in agriculture did not influence women's perceived access to food groups

	n	Crude change in mean child dietary diversity score	
		β (95% CI)	p-value
Time in agriculture per day**			
0 min	74	base	
1-30 min	35	0.4 (0.0, 0.7)	0.06
31-90 min	47	0.2 (-0.1, 0.6)	0.14
91- 375 min	45	0.2 (-0.2, 0.5)	0.32



Reduced DAG



Total, direct and indirect effects

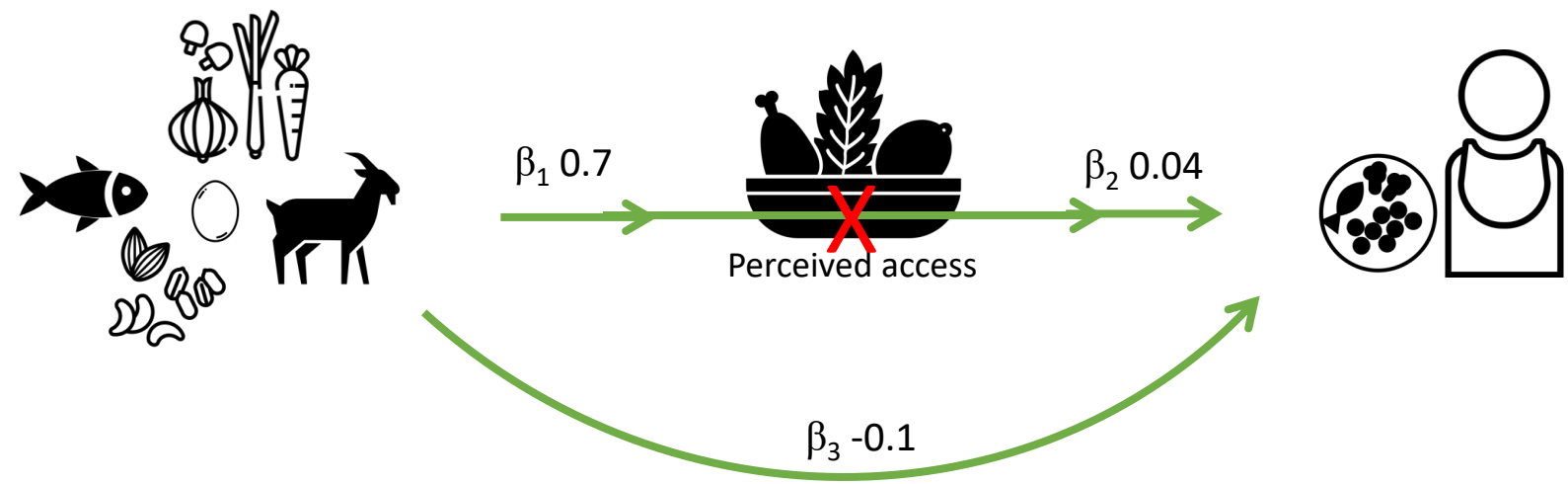


Table 7 Crude and adjusted total and direct effects of production diversity score on child dietary diversity score and the indirect effect via perceived access to food groups score (n=207)

Mean change in child dietary diversity score with increasing household agricultural production diversity score						
	Crude		Adjusted (model 1)*		Adjusted (model 2)**	
	β (95% CI)	p-value	β (95% CI)	p-value	β (95% CI)	p-value
Total effect	-0.1 (-0.2, 0.03)	0.17	-0.1 (-0.2, 0.02)	0.10	-0.04 (-0.2, 0.1)	0.46
Direct effect	-0.1 (-0.2, 0.0005)	0.05	-0.1 (-0.2, -0.01)	0.03	-0.1 (-0.2, -0.02)	0.02
Indirect effect (via perceived access to food groups)	0.02 (0.004, 0.05)	0.02	0.03 (0.01, 0.05)	0.006	0.1 (0.01, 0.1)	0.03

*Adjusted for all *a priori* identified covariates

**Adjusted for covariates of model 1 and an interaction of perceived access to food groups with deprivation

($p_{[interaction]} = 0.02$)

Total, direct and indirect effects

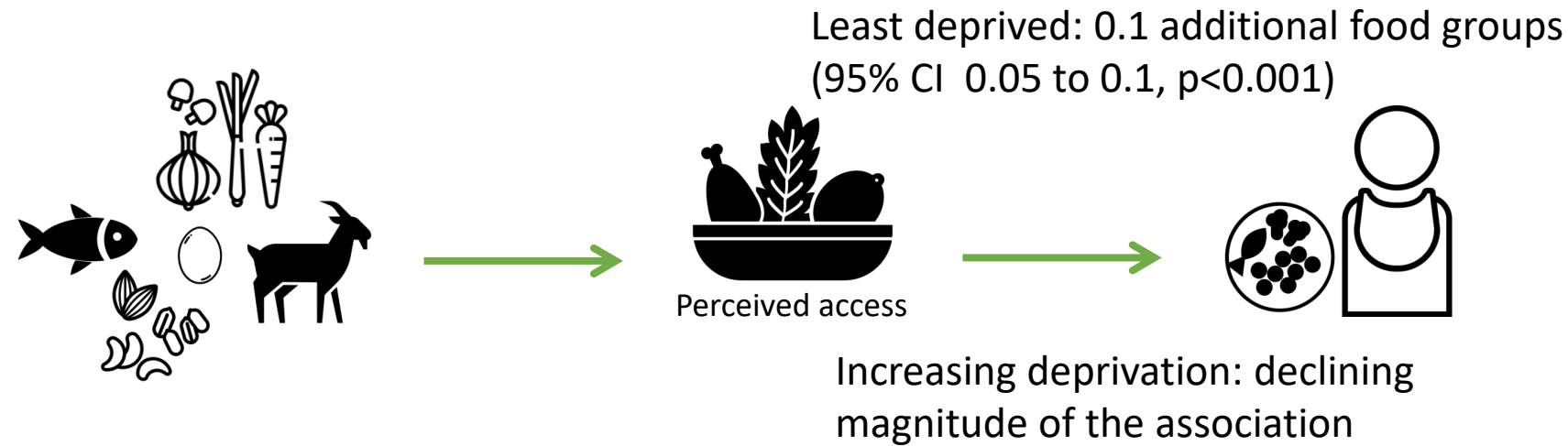


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↑ CDD of 0.6 food groups from the lowest to the highest observed PD (red PD = 0.02)

Conclusion

- No total effect of PD on CDD – linear or curve-linear
- Masked by competing pathways with associations in opposite directions
 - Negative direct effect
 - Positive indirect effect via women's perceived access to food groups
 - Less deprived women were better able to translate improved perceived access to diverse foods into CDD
- Women's time use in agriculture was low
 - PD did not influence women's time use in agriculture
 - Time in agriculture did not appear to influence CDD or women's perceived access to food groups
- Mediation analyses (e.g., SEM) are important when examining the complex processes via which PD may act on CDD, because involved pathways likely act in opposite directions



Thank you!

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Tina Bonde Sørensen, PhD
tinabondesoerensen@gmail.com
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