



European Economic Association Annual Conference Bocconi University – 23 August 2022

The Formation and Malleability of Dietary Habits: a field experiment with low income families

Michèle Belot (Cornell University) Noemi Berlin (Universite Paris Nanterre) Jonathan James (University of Bath) Valeria Skafida (University of Edinburgh)



How can we encourage and sustain healthier dietary choices?

What we do

- 1. Evaluate two interventions targeting dietary habits of young children and their families
 - (1) Targeting what people eat: Providing ingredients and recipes
 - (2) Targeting how people eat (addressing erratic eating habits): Avoid snacks and stick to regular eating schedule

2.Focus on low SES <u>families</u> with a child between the age of 2 and 6

- Correlation between SES and health (and obesity)
- 3. Collect a range of measures to get a better picture of dietary choice
- 4. Evaluate long term effects (up to 3 years)

Protocol 1

Increase exposure to a "healthier diet" for a period of 3 months

Protocol are provided everything at home to prepare and eat 5 specific meals a week for a period of 3 months

To maximise compliance:

- 1. Ease and convenience: Recipes and ingredients delivered at home
- 2. Provided free of charge
- 3. Families are requested to photograph their meals and fill in a feedback leaflet

Possible impact on taste formation

Possible temporary impact on calorie intake and diet composition

Turkey & pepper stir-fry



Serves: 2 people Preparation time: 15 minutes Cooking time: 30 minutes

Ingredients:

150g wholegrain brown rice
1 tbsp vegetable oil
225g skinless turkey breast sliced into strips
1 garlic cloves crushed
1 red pepper deseeded and sliced
1 pepper, any colour deseeded and sliced
5 spring onions sliced
1 tbsp reduced salt soy sauce
3 tbsp orange juice
1 tsp ground ginger (optional)

What to do:

1. Put the rice on to cook in plenty of boiling water for 25-30 minutes, until tender.

2. When the rice has been cooking for 20 minutes, heat the oil in a wok or large frying pan and stir-fry the turkey over a medium-high heat for 5 minutes.

3. Add the garlic, peppers and spring onions and fry for another 2-3 minutes.

4. Next, add the soy sauce, orange juice and ground ginger (if using) to the turkey and cook for a further 2-3 minutes over a medium heat.

5. Drain the rice and serve with the turkey stir-fry.

Burgers with a bite



A touch of fresh chilli adds a fiery hit to these burgers - though just leave it out if chilli isn't for you!

Serves: 2 people Preparation time: 25 minutes Cooking time: 15 minutes

Ingredients:

340g lean minced beef
1 medium onion very finely chopped
1 carrot grated
1 courgette grated
1 tsp green chilli finely chopped
1 tsp dried mixed herbs
1 pinch ground black pepper
3 wholemeal burger buns sliced in two
1 handful lettuce leaves shredded
1 tomato sliced

What to do:

1. In a large bowl, mix together the minced beef, onion, carrot, courgette, chilli and herbs. Season with black pepper. Mix thoroughly, then use damp hands to shape the mixture into 3 burgers. Cover and chill, if cooking them later.

2. Preheat the grill or a char-grill pan. Grill or char-grill the burgers for 12-15 minutes, turning them over once, until browned and cooked through.

3. Lightly toast the burger buns on the cut sides only. Put some lettuce onto the bun bases, then add the burgers and sliced tomatoes then pop the bun tops in place.

WEEK 2 - from September 21 Recipe description	Preparation Difficulty 1 very easy, 2 easy, 3 moderate, 4 difficult, 5 very difficult	Did it taste good? (Circle as appropriate)			
Date: Meal:		Ур		GOOD	
Date: Meal:		У YUCK!	•••	GOOD	
Date: Meal:		У р YUCKI	•••	GOOD	
Date: Meal:		У УUCK!	•••	GOOD	
Date: Meal:		У Ч У У И СК!	мен	GOOD	

Protocol 2

Increase regularity of food intake and snacking in particular

Protocol instructing families to stick to regular meal times and to 3 meals a day (+ 2 additional snacks at regular times for children)

Motivation for protocol

- 1. Related literature in biology
- 2. Snacks appear to represent a large portion of daily calorie intake. For children, a USbased study by Piemas and Popkin (2010) shows that children get 27% of their daily calorie intake through snacks.
- 3. But mixed evidence on the effects of "snacking" (Larson and Story, 2013)

To encourage compliance:

1. Leaflet to complete with times

Possible impact on calorie intake

List of Healthy Snacks Weeks 1, 3, 5, 7, 9, 11

These snacks are for **1 child**, for **6 days**, **twice a day**. The baskets will be adapted to the number of children in your household (so multiply by the number of children).

Note that the quantities for one snack are only suggestions. You can adapt them to your child's appetite.

List of snacks per week	Quantities for one snack
6 pieces of fruit (e.g. bananas, apple, pear, orange)	1 piece of fruit
1 low fat soft cheese (200g) with 1 packet of oat cakes (should be enough for 2 snacks)	soft cheese with oat cakes according to your child appetite and needs
4 yogurts of 125g each	1 snack. Please do not add any sugar or honey.

A reminder of the main recommendations for children:

• Stick to regular meal times (same as for the parents)



• In addition to the main meals, children can also get a snack in the morning and in the afternoon. Toddlers (2-4 year old) can consume a third additional snack during the day

• You will try to provide your children with snacks <u>at</u> <u>very regular times</u> during the day (for example 10 am, 3 pm).

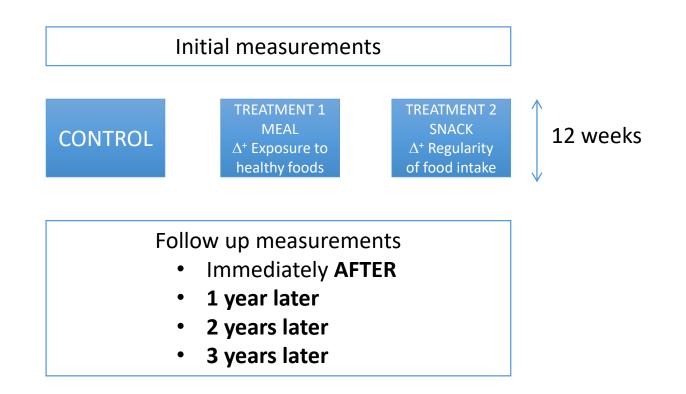
EXAMPLE

MAIN STUDY	Day off	Breakfast time	Lunch time	Dinner	Deviations from protocol
ADULT	Protocol			time	(snacks between meals)
	(Tick				Yes / No
	appropriate				
	day)				
Monday		8:00	13:00	17:30	No
Tuesday		8:00	13:00	17:30	No
Wednesday		8:00	13:00	17:30	No
Thursday	Х	8:30	12:00	17:30	Day off
Friday		8:00	13:00	17:30	Yes
Saturday		8:00	13:00	17:30	No
Sunday		8:00	13:00	17:30	No

MAIN STUDY	Day off	Breakfast	Morning	Lunch time	Afternoo	Dinner	Deviations from protocol
<u>CHILD</u>	Protocol	time	snack		n snack	time	(Additional snacks)
			time		time		
Monday		8:00	10:30	13:00	15:00	17:30	No
Tuesday		8:00	10:30	13:00	15:00	17:30	No
Wednesday		8:00	10:30	13:00	15:00	17:30	No
Thursday	Х	8:30	10:30	12:00	15:00	17:30	Day off
Friday		8:00	10:30	13:00	15:00	17:30	Yes
Saturday		8:00	10:30	13:00	15:00	17:30	No
Sunday		8:00	10:30	13:00	15:00	17:30	No

Experimental Design

• Randomized controlled experiment with around 300 low SES families with young children (2 to 6 years old)



Sample

- Families recruited in Edinburgh and Essex
- Intervention conducted in the spring (Edinburgh) and fall (Essex) of 2015
- Eligibility criteria
 - A household income < £26,426 for Scotland, £26,600 for England (not enforced)
 - Having a child between 2 and 6 years old.
 - Owning a fridge and a hob
 - Living in Edinburgh or Colchester
 - No serious diseases
- Monetary compensation (£350 in total over 3 years in Edinburgh, £400 in Essex)

Sample size and attrition

Table 1 Sample size. Number of participating households.

• "Baseline" refers to before the interventions, and "after" to just after the interventions

	Control	Meal	Snack	Total
Total baseline	111	103	71	285
Total after	109	101	64	274
Total 1 year follow-up	100	92	56	248
Total 2 year follow-up	99	87	53	239
Total 3 year follow-up	92	90	51	233

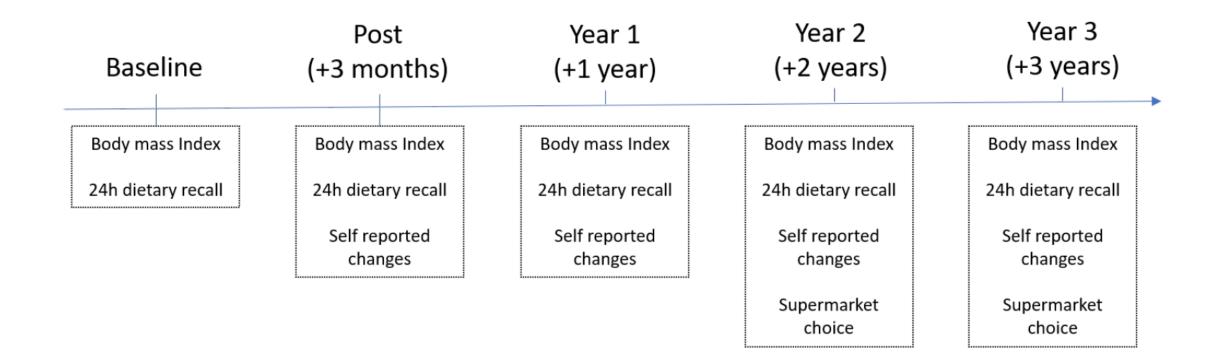
	Control	Meal Mean (std)	Snack	P-value	P-value
	(1)	(2)	(3)	(1) = (2)	(1) = (3)
Sample Size (Families)					
Start of the study	111	103	71	-	-
After of the intervention	109	101	64	-	-
3 years later	92	90	51	-	-
Demographics					
% Female adults among all sample	72.2	79.6	75.3	0.15	0.59
# Adults in household	1.7	1.61	1.7	0.43	0.85
	(0.85)	(0.6)	(0.7)		
# Children in household	1.9	1.8	1.9	0.47	0.9
	(0.9)	(1.0)	(1.0)		
Age (adults)	35.1	34.7	34	0.67	0.23
	(7.5)	(6.5)	(6.9)		
Age (study child)	3.9	4	3.9	0.99	0.75
	(1.7)	(1.7)	(1.4)		
Mean annual household income	20,855	21,167	23,928	0.87	0.15
	(10,056)	(19, 227)	(21, 844)		
% Receiving housing benefits	37.8	41.7	38.0	0.56	0.98
% Receiving income support	22.5	17.5	22.5	0.36	0.99
% No qualifications	2.7	3.1	3.2	0.85	0.81

Table 1: Demographic characteristics at baseline and across groups

Compliance

- Hard to assess (hence "intention to treat")
 - Meal treatment: Pictures of the food + self-reported feedback
 - 63% unique pictures returned
 - 81% feedback leaflets returned
 - Snack treatment: self-reported feedback
 - 69% feedback leaflets returned
 - 20% self-reported deviations from protocol

Measures and timeline



Empirical strategy

• Difference-in-difference estimates (with individual fixed effects):

 $Y_{i,g,t} = \alpha_i + D_t + \beta_t Meal_i \times D_t + \gamma_t Snack_i \times D_t + \varepsilon_{i,t}$

	Estimate	Post	Year 1	Year 2	Year 3
Body Mass Index (z-score for children)	DD	-0.21 (0.06)***	-0.23 (0.08)***	-0.21 (0.09)***	-0.34 (0.12)***
Joint significance of all coefficients			0.003	[0.004]	
Total calories (kcal)					
24h-dietary recall	DD	-54.8(72.4)	-101.0(108.3)	-156.5(115.0)	86.6(116.6)
Supermarket parental choice	Treat-Control			-20.3(21.0)	3.8(22.4)
Joint significance coefficients by year				0.244	0.75
Joint significance of all coefficients			0.389	[0.389]	
Sugar					
24h-dietary recall (added sugar, g)	DD	-6.0(5.3)	-21.9 (8.1)***	-26.7 (10.2)***	2.7(8.9)
Self-reported changes (foods high in sugar)	Treat-Control	-0.3(0.4)	-1.4 (0.4)***	-0.8 (0.4)**	-0.7 (0.4)**
Supermarket parental choice (g)	Treat-Control			-4.4 (1.6)***	-2.0(1.6)
Joint significance coefficients by year		0.4427	0.0000	0.0008	0.1275
Joint significance of all coefficients			0.000	[0.001]	
Fat					
24h-dietary recall (saturated fat, g)	DD	-2.8(1.9)	-3.1(2.5)	-3.2(2.5)	-0.7(2.6)
Self-reported changes (foods high in fat)	Treat-Control	-1.2 (0.3)***	-1.2 (0.4)***	-0.4(0.3)	0.1(0.4)
Supermarket parental choice (saturated fat in g)	Treat-Control			-1.0(0.9)	-0.5(0.9)
Joint significance coefficients by year		0.0007	0.0014	0.2345	0.9263
Joint significance of all coefficients			$0.0006 \ [0.002]$		
Fruit and vegetables					
24h-dietary recall (g)	DD	-16.7(21.1)	-6.5(39.6)	-26.1(26.8)	-37.8(26.2)
Self-report changes	Treat-Control	$0.5 (0.1)^{***}$	$0.4 \ (0.1)^{***}$	$0.2 \ (0.1)^{*}$	0.2(0.1)
Supermarket parental choice (% spent on $F\&V$)	Treat-Control	- *	- *	0.3(0.6)	-0.2(0.5)
Joint significance coefficients by year		0.0000	0.0194	0.2326	0.1983
Joint significance of all coefficients			0.0009	[0.002]	

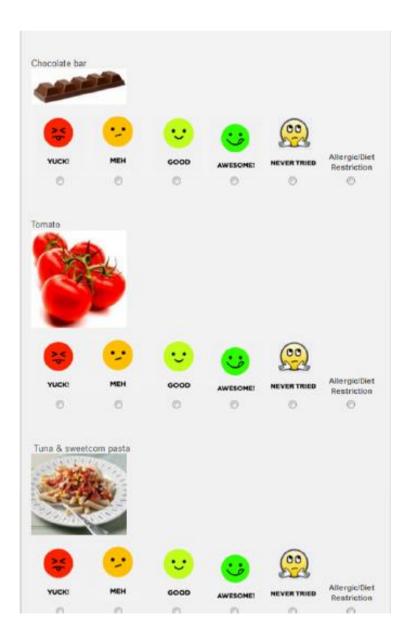
Table 5. Impact of Mear Treatment on Body Mass Index and Diet of Children

Post Estimate Year 1 Year 2 Year 3 Body Mass Index DD -0.21 (0.09)*** $-0.18 (0.11)^*$ -0.16(0.19)-0.12(0.14)Joint significance of all coefficients 0.078 [0.098] Total calories (kcal) 24h-dietary recall DD $-48.4(74)^*$ -133.8 (101.3) -174.4 (110.5) -84.0(106.7)Supermarket parental choice Treat-Control 8.4(25.8)25.8(29.1)Joint significance coefficients by year 0.2770.454Joint significance of all coefficients 0.626 [0.626]Sugar 24h-dietary recall (added sugar, g) DD $-19.0(8.6)^{**}$ $-18.7 (10.6)^*$ -0.5(4.7)-7.2(9.0)Self-reported changes (foods high in sugar) Treat-Control $-0.9 (0.5)^*$ $-0.7(0.4)^*$ -0.1(0.4)0.1(0.4)Supermarket parental choice (g) Treat-Control 0.7(1.9)2.1(2.3)Joint significance coefficients by year 0.32920.62380.16260.0276Joint significance of all coefficients 0.0615 [0.098] Fat 24h-dietary recall (saturated fat, g) DD -1.5(2.0)-1.5(2.4)-3.0(2.4)-1.7(2.5) $-1.3(0.4)^{***}$ Self-reported changes (foods high in fat) Treat-Control -0.4(0.4)0.03(0.4)0.8(0.4)Supermarket parental choice (saturated fat in g) Treat-Control 0.1(1.2)0.4(1.1)*Joint significance coefficients by year* 0.00150.56090.66470.2104 Joint significance of all coefficients 0.0007 [0.003]Fruit and vegetables consumption DD 24h-dietary recall (g) -23.4(25.6)-31.7(32.6)-30.1(30.8)-24.0(29.8) $0.6 (0.1)^{***}$ $0.5 (0.1)^{***}$ Self-report changes Treat-Control 0.1(0.2) $0.3 (0.2)^*$ Supermarket parental choice (% spent on F&V) Treat-Control 0.5(0.8)-0.4(0.8)Joint significance coefficients by year 0.3090.0000 0.00550.5800Joint significance of all coefficients 0.0009 [0.003]

Table 4: Impact of Snack Treatment on Body Mass Index and Diet of Children

II: Mechanism: Food preferences

- Non incentivized measure
- Incentivized measure (year 3 for children)



Result II.1 – Food preferences (CHILDREN)

Table 6:	The impact	of Meal and	Snack treatments	on food	preferences
----------	------------	-------------	------------------	---------	-------------

	Fruits	Vegetables	Meat Fish Eggs	Processed Food	Sweets	Bread	Cheese
Panel A: Children							
After	0.13^{**}	-0.06	0.00	0.07	-0.14**	0.05	0.20**
	(0.06)	(0.07)	(0.10)	(0.05)	(0.07)	(0.09)	(0.10)
1-year	0.05	-0.01	0.16	0.06	-0.09	0.01	0.02
	(0.07)	(0.08)	(0.10)	(0.07)	(0.08)	(0.10)	(0.11)
2-year	0.09	-0.09	0.02	0.08	-0.16**	0.03	0.03
	(0.09)	(0.09)	(0.12)	(0.07)	(0.08)	(0.11)	(0.13)
3-year	0.03	-0.11	0.11	-0.07	-0.29***	-0.14	-0.24*
	(0.09)	(0.09)	(0.11)	(0.07)	(0.09)	(0.10)	(0.14)
Meal x After	-0.10	0.01	-0.07	-0.21***	0.17^{*}	-0.17	-0.33**
	(0.09)	(0.10)	(0.14)	(0.08)	(0.09)	(0.13)	(0.13)
Meal x 1-year	-0.01	0.03	-0.08	-0.09	0.10	-0.11	-0.08
	(0.10)	(0.11)	(0.15)	(0.09)	(0.13)	(0.13)	(0.16)
Meal x 2-year	-0.06	0.04	-0.08	-0.13	0.23^{*}	-0.21	-0.19
	(0.12)	(0.12)	(0.16)	(0.09)	(0.13)	(0.14)	(0.18)
Meal x 3-year	-0.04	0.08	-0.20	-0.03	0.20	-0.13	0.03
	(0.12)	(0.12)	(0.16)	(0.09)	(0.13)	(0.14)	(0.18)
Snack x After	0.03	0.13	-0.14	0.02	0.21^{**}	0.24^{*}	-0.18
	(0.11)	(0.11)	(0.14)	(0.09)	(0.10)	(0.15)	(0.16)
Snack x 1-year	0.15	0.13	-0.26	0.04	-0.04	0.13	-0.12
	(0.12)	(0.12)	(0.19)	(0.10)	(0.15)	(0.14)	(0.17)
Snack x 2-year	0.16	0.26^{**}	-0.19	0.15	0.18	0.12	-0.21
	(0.13)	(0.12)	(0.18)	(0.12)	(0.11)	(0.17)	(0.20)
Snack x 3-year	0.09	0.06	-0.17	0.07	-0.10	-0.04	-0.23
	(0.15)	(0.11)	(0.18)	(0.12)	(0.14)	(0.17)	(0.21)
Constant	3.19***	2.58^{***}	2.66^{***}	3.35^{***}	3.52^{***}	3.47^{***}	3.29^{***}
	(0.03)	(0.03)	(0.04)	(0.02)	(0.03)	(0.04)	(0.04)
# Obs	1,243	1,254	1,254	1,257	1,251	1,248	$1,\!244$
R-squared	0.01	0.01	0.01	0.02	0.04	0.03	0.03
# individuals	288	289	289	289	289	289	288

Result II.1 – Food preferences (CHILDREN)

Table 6: The i	mpact of Meal	and Snack treatments	on food preferences
----------------	---------------	----------------------	---------------------

	Fruits	Vegetables	Meat Fish Eggs	Processed Food	Sweets	Bread	Cheese
Panel A: Children							
After	0.13^{**}	-0.06	0.00	0.07	-0.14**	0.05	0.20^{**}
	(0.06)	(0.07)	(0.10)	(0.05)	(0.07)	(0.09)	(0.10)
1-year	0.05	-0.01	0.16	0.06	-0.09	0.01	0.02
	(0.07)	(0.08)	(0.10)	(0.07)	(0.08)	(0.10)	(0.11)
2-year	0.09	-0.09	0.02	0.08	-0.16**	0.03	0.03
	(0.09)	(0.09)	(0.12)	(0.07)	(0.08)	(0.11)	(0.13)
3-year	0.03	-0.11	0.11	-0.07	-0.29***	-0.14	-0.24*
	(0.09)	(0.09)	(0.11)	(0.07)	(0.09)	(0.10)	(0.14)
Meal x After	-0.10	0.01	-0.07	-0.21***	0.17^{*}	-0.17	-0.33**
	(0.09)	(0.10)	(0.14)	(0.08)	(0.09)	(0.13)	(0.13)
Meal x 1-year	-0.01	0.03	-0.08	-0.09	0.10	-0.11	-0.08
	(0.10)	(0.11)	(0.15)	(0.09)	(0.13)	(0.13)	(0.16)
Meal x 2-year	-0.06	0.04	-0.08	-0.13	0.23^{*}	-0.21	-0.19
	(0.12)	(0.12)	(0.16)	(0.09)	(0.13)	(0.14)	(0.18)
Meal x 3-year	-0.04	0.08	-0.20	-0.03	0.20	-0.13	0.03
	(0.12)	(0.12)	(0.16)	(0.09)	(0.13)	(0.14)	(0.18)
Snack x After	0.03	0.13	-0.14	0.02	0.21**	0.24^{*}	-0.18
	(0.11)	(0.11)	(0.14)	(0.09)	(0.10)	(0.15)	(0.16)
Snack x 1-year	0.15	0.13	-0.26	0.04	-0.04	0.13	-0.12
	(0.12)	(0.12)	(0.19)	(0.10)	(0.15)	(0.14)	(0.17)
Snack x 2-year	0.16	0.26^{**}	-0.19	0.15	0.18	0.12	-0.21
	(0.13)	(0.12)	(0.18)	(0.12)	(0.11)	(0.17)	(0.20)
Snack x 3-year	0.09	0.06	-0.17	0.07	-0.10	-0.04	-0.23
	(0.15)	(0.11)	(0.18)	(0.12)	(0.14)	(0.17)	(0.21)
Constant	3.19^{***}	2.58^{***}	2.66^{***}	3.35^{***}	3.52^{***}	3.47***	3.29^{***}
	(0.03)	(0.03)	(0.04)	(0.02)	(0.03)	(0.04)	(0.04)
# Obs	1,243	1,254	1,254	1,257	1,251	1,248	1,244
R-squared	0.01	0.01	0.01	0.02	0.04	0.03	0.03
# individuals	288	289	289	289	289	289	288

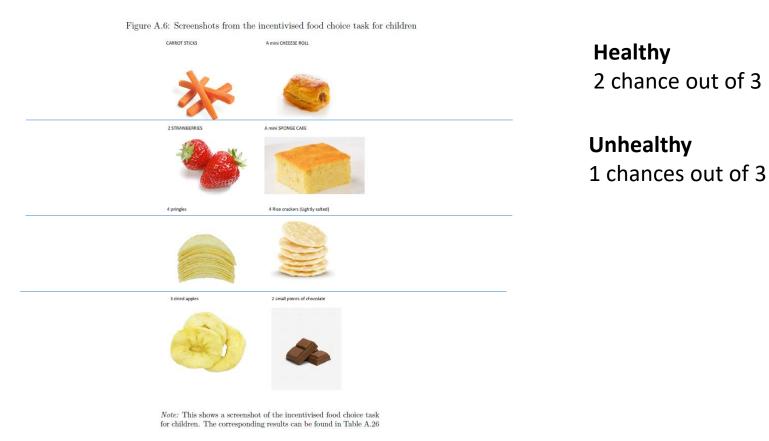
Result II.1 – Food preferences (CHILDREN)

Table 6:	The impact	of Meal and	Snack treatments	on food	preferences
----------	------------	-------------	------------------	---------	-------------

	Fruits	Vegetables	Meat Fish Eggs	Processed Food	Sweets	Bread	Cheese
Panel A: Children							
After	0.13^{**}	-0.06	0.00	0.07	-0.14**	0.05	0.20^{**}
	(0.06)	(0.07)	(0.10)	(0.05)	(0.07)	(0.09)	(0.10)
1-year	0.05	-0.01	0.16	0.06	-0.09	0.01	0.02
	(0.07)	(0.08)	(0.10)	(0.07)	(0.08)	(0.10)	(0.11)
2-year	0.09	-0.09	0.02	0.08	-0.16**	0.03	0.03
	(0.09)	(0.09)	(0.12)	(0.07)	(0.08)	(0.11)	(0.13)
3-year	0.03	-0.11	0.11	-0.07	-0.29***	-0.14	-0.24*
	(0.09)	(0.09)	(0.11)	(0.07)	(0.09)	(0.10)	(0.14)
Meal x After	-0.10	0.01	-0.07	-0.21***	0.17^{*}	-0.17	-0.33**
	(0.09)	(0.10)	(0.14)	(0.08)	(0.09)	(0.13)	(0.13)
Meal x 1-year	-0.01	0.03	-0.08	-0.09	0.10	-0.11	-0.08
	(0.10)	(0.11)	(0.15)	(0.09)	(0.13)	(0.13)	(0.16)
Meal x 2-year	-0.06	0.04	-0.08	-0.13	0.23*	-0.21	-0.19
-	(0.12)	(0.12)	(0.16)	(0.09)	(0.13)	(0.14)	(0.18)
Meal x 3-year	-0.04	0.08	-0.20	-0.03	0.20	-0.13	0.03
	(0.12)	(0.12)	(0.16)	(0.09)	(0.13)	(0.14)	(0.18)
Snack x After	0.03	0.13	-0.14	0.02	0.21**	0.24*	-0.18
	(0.11)	(0.11)	(0.14)	(0.09)	(0.10)	(0.15)	(0.16)
Snack x 1-year	0.15	0.13	-0.26	0.04	-0.04	0.13	-0.12
-	(0.12)	(0.12)	(0.19)	(0.10)	(0.15)	(0.14)	(0.17)
Snack x 2-year	0.16	0.26**	-0.19	0.15	0.18	0.12^{-1}	-0.21
*	(0.13)	(0.12)	(0.18)	(0.12)	(0.11)	(0.17)	(0.20)
Snack x 3-year	0.09	0.06	-0.17	0.07	-0.10	-0.04	-0.23
~	(0.15)	(0.11)	(0.18)	(0.12)	(0.14)	(0.17)	(0.21)
Constant	3.19***	2.58***	2.66***	3.35***	3.52***	3.47***	3.29***
	(0.03)	(0.03)	(0.04)	(0.02)	(0.03)	(0.04)	(0.04)
# Obs	1,243	1,254	1,254	1,257	1,251	1,248	1,244
R-squared	0.01	0.01	0.01	0.02	0.04	0.03	0.03
# individuals	288	289	289	289	289	289	288

Result II. 2: Incentivized measure children

• Choice between a healthy and unhealthy snack



Result II.2: Incentivized measure - children

	Numbe	er of unhea	althy items chosen
Meal	0.048	0.061	0.085
	(.164)	(.168)	(.170)
Snack	-0.184	-0.15	-0.132
	(.192)	(.196)	(.197)
Risk preference		0.006	0.003
		(.031)	(.031)
Controls for gender and age	Ν	Ν	Y
Observations	212	212	212
R-squared	0.006	0.007	0.0165

Table 15: Treatment effects on children's incentivized food preferences in Year 3

Note: Each column in each panel represents a separate linear regression.

Conclusion

- Two interventions targeting dietary habits
 - Contents of the diet / exposure
 - Frequency of dietary intake
- Evidence of long term effects for intervention 1
- No long term changes in preferences; perhaps temporary restriction of access to certain foods?
- Perhaps a temporary improvement in diet can have long lasting effects
- Important because then one does not necessarily need to find an intervention that changes habits in the longer run