

Supplementary Materials

Figure S1. Directed acyclic graph of hypothesized association between lutein and zeaxanthin intake during pregnancy and visual function in offspring at age 11-12 years. Graph created using DAGitty software [36].

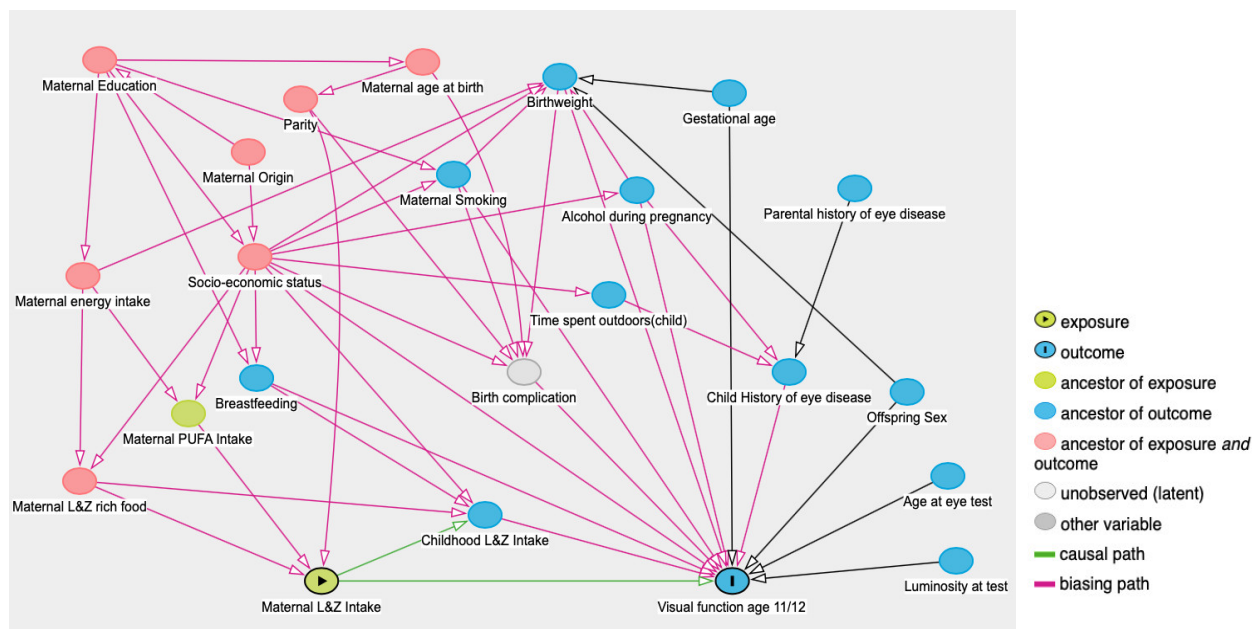


Table S1. Comparison of baseline characteristics of study participants and those lost to follow up or with visual testing issues. Based on the Sabadell cohort of the Spanish Childhood and Environment (INMA) Project.

	<i>n</i>	Study cohort	<i>n</i>	Excluded Cohort	<i>P</i> value
Maternal Covariates					
Lutein & Zeaxanthin (energy adjusted) Intake (mg/day), Week 12 Mean (SD)	429	3.5 (2.0)	225	3.6 (2.3)	0.8591 ^a
Week 32 Mean (SD)	427	3.4 (2.1)	188	3.5 (2.1)	0.6060 ^a
Total energy intake (kcal/day) Week 12 Mean (SD)	429	2050.3 (482.0)	225	2263.0 (600.5)	<0.001 ^a
Week 32 Mean (SD)	427	2084.7 (469.5)	188	2305.0 (626.3)	<0.001 ^a
Age (years) Mean (SD)	430	31.93 (4.1)	189	30.5 (4.8)	<0.001 ^a
Parity, <i>n</i> (%)			224		
Nulliparous	429	250 (58.3)		115 (51.3)	
Parity 1 or more		179 (41.7)		109 (48.7)	0.09 ^b
Ethnicity, <i>n</i> (%)			225		
White	430	423 (98.4)		210 (93.3)	
Other Ethnic Group		7 (1.6)		15 (6.7)	0.001 ^b
Maternal education, <i>n</i> (%)			225		
Primary or less	428	102 (23.8)		87 (38.7)	
Secondary		182 (42.5)		97 (43.1)	<0.001 ^b
Tertiary		144 (33.6)		41 (18.2)	
Social Class, <i>n</i> (%)			226		
Low	431	183 (42.5)		149 (65.9)	
Medium		144 (33.4)		55 (24.3)	<0.001 ^b
High		104 (24.1)		22 (9.73)	
Smoking during pregnancy, <i>n</i> (%)	431	316 (73.3)	226	155 (68.6)	0.201 ^b
No					

Yes		115 (26.7)		71 (31.4)	
Alcohol during pregnancy, n (%)					
No	431	333 (77.3)	225	177 (78.7)	0.681 ^b
Yes		98 (22.7)		48 (21.3)	
Maternal PUFA Intake (g/day)					
Week 12 Mean (SD)	422	14.2 (3.1)	225	14.1 (3.8)	0.7145 ^a
Week 32 Mean (SD)	416	13.5 (2.7)	185	13.4 (3.3)	0.8697 ^a
Child Covariates					
Sex, n (%)					
Female	431	209 (48.5)	189	98 (51.9)	0.441 ^b
Male		222 (51.5)		91 (48.2)	
Gestation (weeks) at birth, Mean (SD)	431	39.7 (1.4)	189	39.5 (2.0)	0.0723 ^a
Birthweight Mean (SD)	431	3271.0 (405.3)	186	3159.9 (518.3)	0.0098 ^a
Breastfeeding (weeks) Mean (SD)	430	12.8 (9.5)	175	10.9 (9.0)	0.0192 ^a
Lutein and Zeaxanthin Intake Age 4 (mg/day) Mean (SD)	377	0.9 (0.5)	63	0.78 (0.4)	0.0107 ^a

^a – p-value from t-Test ^b – p-value from CHI Squared Test ^c – p-value from Fisher Exact Test.

Table S2. Baseline characteristics of participants according to tertile of energy adjusted lutein and zeaxanthin consumption during the third trimester (32 week assessment) of pregnancy. Based on the Sabadell cohort of the Spanish Childhood and Environment (INMA) Project.

	<i>n</i>	Total	1 st Tertile (Low)	2 nd Tertile (Medium)	3 rd Tertile (High)	<i>P</i> value
Maternal Covariates						
Lutein & Zeaxanthin (energy adjusted) Intake (mg/day), n			143	142	142	
Mean (SD)	427	3.4 (2.1)	1.6 (0.4)	2.9 (0.4)	5.8 (1.9)	
Rank		0.2 -13.1	0.2-2.3	2.3-3.6	3.6-13.1	
Total energy intake (kcal/day) Mean (SD)	427	2084.8 (469.5)	2079.8 (451.6)	2103.9 (458.6)	2070.6 (499.8)	0.827 ^a
Age (years) Mean (SD)	429	31.9 (4.1)	30.7 (4.5)	32.9 (3.9)	32.1 (3.7)	<0.0001 ^a
Parity, n (%)						
Nulliparous	425	247 (58.1)	93 (65.5)	71 (50.0)	83 (58.9)	0.029 ^b
Parity 1 or more		178 (41.9)	49 (34.5)	71 (50.0)	58 (41.1)	
Ethnicity, n (%)						
White	426	419 (98.4)	142 (99.3)	140 (98.6)	137 (97.2)	0.273 ^c
Other Ethnic Group		7 (1.6)	1 (0.7)	2 (1.4)	4 (2.8)	
Maternal education, n (%)						
Primary or less	424	100 (23.6)	41 (28.7)	24 (16.9)	35 (25.2)	0.016 ^b
Secondary		182 (42.9)	68 (47.6)	61 (43.0)	53 (38.1)	
Tertiary		142 (33.5)	34 (23.8)	57 (40.1)	51 (37.0)	
Social Class, n (%)						
High	427	104 (24.1)	24 (16.8)	43 (30.3)	36 (25.4)	0.022 ^b
Medium		143 (33.5)	44 (30.8)	49 (34.5)	50 (35.2)	
Low		181 (42.4)	75 (52.5)	50 (35.2)	56 (39.4)	
Smoking during pregnancy, n (%)						
No	427	313 (73.3)	101 (70.6)	102 (71.8)	110 (77.5)	0.380 ^b
Yes		114 (26.7)	42 (29.4)	40 (28.2)	32 (22.5)	
Alcohol during pregnancy, n (%)	427					

No		330 (77.3)	106 (74.1)	113 (79.6)	111 (78.2)	0.522 ^b
Yes		97 (22.7)	37 (25.9)	29 (20.4)	31 (21.8)	
Maternal PUFA Intake (g/day)	416					
Mean (SD)		13.5 (2.7)	13.6 (2.6)	13.3 (2.2)	13.5 (3.3)	0.7482 ^a
Child Covariates						
Sex, n (%)						
Female	427	206 (48.2)	71 (49.7)	70 (49.3)	65 (45.8)	0.770 ^b
Male		221 (51.8)	72 (50.4)	72 (50.7)	77 (54.2)	
Prematurity (<37 weeks gestation)						
No	427	417 (97.7)	139 (97.2)	140 (98.6)	138 (97.2)	0.782 ^c
Yes		10 (2.3)	4 (2.8)	2 (1.4)	4 (2.8)	
Gestation (weeks) at birth,	427					
Mean (SD)		39.8 (1.4)	39.8 (1.3)	39.7 (1.5)	39.6 (1.3)	0.8097 ^a
Birthweight	427	3273.2 (403.9)	3283.7 (416.2)	3275.0 (399.4)	3260.7 (398.4)	0.8894 ^a
Mean (SD)						
Predominant Breastfeeding (weeks)	426	12.8 (9.5)	12.6 (9.4)	13.6 (9.3)	12.2 (9.7)	0.4192 ^a
Mean (SD)						
Lutein and Zeaxanthin Intake Age 4	373					
(mg/day)						
Mean (SD)		0.9 (0.5)	0.8 (0.4)	0.9 (0.5)	1.1 (0.5)	0.0001 ^a

Vision Covariates						
Parental History of Eye Disease ^d n (%)						
None	418	84 (20.1)	28 (20.0)	31 (22.3)	25 (18.0)	0.263 ^b
One Parent		179 (42.8)	63 (45.0)	49 (35.3)	67 (48.2)	
Both parents		155 (37.1)	49 (35.0)	59 (42.5)	47 (33.8)	
Childhood history of eye disease ^d n (%)						
No	419	329 (78.5)	117 (83.6)	106 (75.7)	106 (76.3)	0.203 ^b
Yes		90 (21.5)	23 (16.4)	34 (24.3)	33 (23.7)	
Age at Eye Test (years)	427					
Mean (SD)		11.2 (0.5)	11.1 (0.5)	11.1 (0.5)	11.3 (0.5)	0.0023 ^a

^a – p-value from ANOVA ^b – p-value from CHI Squared Test ^c – p-value from Fisher Exact Test ^d – Includes any reported ametropia but excluding presbyopia.

Table S3. Baseline characteristics of participants according to visual acuity and contrast sensitivity status. Based on the Sabadell cohort of the Spanish Childhood and Environment (INMA) Project.

	<i>n</i>	Visual Acuity (Below 20 th Centile)	Visual Acuity (Above 20 th Centile)	P value	<i>n</i>	Contrast Sensi- tivity (Below 20 th Cen- tile)	Contrast Sensitivity (Above 20 th Centile)	P value
Maternal Covariates		<i>n</i> = 89	<i>n</i> = 341			<i>n</i> = 93	<i>n</i> = 335	
Lutein & Zeaxanthin (energy adjusted) Intake (mg/day)								
Week 12, Mean (SD)	428	3.7 (2.0)	3.5 (2.0)	0.3694 ^a	426	3.6 (1.9)	3.5 (2.0)	0.8605 ^a
Week 32, Mean (SD)	426	3.5 (2.2)	3.4 (2.0)	0.6877 ^a	424	3.8 (1.9)	3.4 (2.5)	0.1040 ^a
Total energy intake (kcal/day)							2040.8	
Week 12 Mean (SD)	428	2039.5 (400.1)	2054.2 (502.1)	0.7984 ^a	426	2089.1 (450.7)	(491.9)	0.3966 ^a
Week 32 Mean (SD)	426	2106.6 (434.7)	2079.2 (479.4)	0.6253 ^a	424	2099.4 (455.6))	2078.7 (474.2)	0.7067 ^a
Age (years)	429				427			
Mean (SD)		32.2 (4.2)	31.8 (4.1)	0.4165 ^a		32.5 (3.9))	31.8 (4.2)	0.1128 ^a
Parity, n (%)	428				426			
Nulliparous		45 (50.6)	204 (60.2)	0.102 ^b		46 (50.0)	202 (60.5)	0.071 ^b

Parity 1 or more		44 (49.4)	135 (39.8)			46 (50.0)	132 (39.5)	
Ethnicity, n (%)								
White	429	89 (100.0)	33 (97.9)	0.353 ^c	427	91 (97.9)	329 (98.5)	0.649 ^c
Other Ethnic Group		0 (0.0)	7 (2.1)			2 (2.2)	5 (1.5)	
Maternal education, n (%)								
Primary or less		28 (31.5)	74 (21.9)			30 (32.3)	71 (21.4)	
Secondary	427	35 (39.3)	146 (43.2)	0.163 ^b	425	38 (40.9)	142 (42.8)	0.067 ^b
Tertiary		26 (29.2)	118 (34.9)			25 (26.9)	119 (35.8)	
Social Class, n (%)								
High		16 (18.0)	88 (25.8)			19 (20.4)	85 (25.4)	
Medium	430	31 (34.8)	112 (32.8)	0.295 ^b	428	29 (31.2)	115 (34.3)	0.354 ^b
Low		42 (47.2)	141 (41.4)			45 (48.4)	135 (40.3)	
Smoking during pregnancy, n (%)								
No	430	66 (74.2)	250 (73.3)	0.872 ^b	428	63 (67.7)	250 (74.6)	0.185 ^b
Yes		23 (25.8)	91 (26.7)			30 (32.3)	85 (25.4)	
Alcohol during pregnancy, n (%)								
No	430	73 (82.0)	259 (76.0)	0.224 ^b	428	73 (78.5)	257 (76.7)	0.718 ^b
Yes		16 (18.0)	82 (24.1)			20 (21.5)	78 (23.3)	
Maternal PUFA Intake (g/day)								
Week 12 Mean (SD)	419	14.7 (4.1)	14.1 (2.8)	0.0921 ^a	419	14.4 (3.1)	14.1 (3.1)	0.4757 ^a
Week 32 Mean (SD)	415	13.6 (2.5)	13.4 (2.8)	0.5628 ^a	413	13.6 (4.5)	13.4 (2.5)	0.5067 ^a
Child Covariates								
Prematurity (<37 weeks gestation) n (%)								
No	430	87 (97.8)	333 (97.7)	1.000 ^c		90 (96.8)	328 (97.9)	0.458 ^c
Yes		2 (2.3)	8 (2.4)			3 (3.2)	7 (2.1)	
Gestation (weeks) at birth, Mean (SD)	430	39.6 (1.5)	39.8 (1.3)	0.4199 ^a	428	39.6 (1.5)	39.8 (1.3)	0.3318 ^a
Birthweight Mean (SD)		3225.4 (441.4)	3282.6 (395.7)			3228.0 (425.1)	3283.32 (400.9)	
Birthweight, n (%)	430			0.2368 ^a	428			0.2459 ^a
<3000,		26 (29.2)	86 (25.22)			31 (33.3)	81 (24.2)	
3000-3500		44 (49.4)	157 (46.0)	0.364 ^b		38 (40.9)	161 (48.1)	0.197 ^b
>3500		19 (21.4)	98 (28.7)			24 (25.8)	93 (27.8)	
Predominant Breastfeeding (weeks)								
Mean (SD)		12.3 (9.5)	13.0 (9.5)			13.5 (9.8)	12.7 (9.4)	
n (%)				0.5695 ^a				
None	429	20 (22.5)	67 (17.7)		427	19 (20.4)	67 (20.1)	0.4699 ^a
0-16 weeks		27 (30.3)	106 (31.2)	0.828 ^b		27 (29.3)	106 (31.7)	0.942 ^b
16-24 weeks		34 (38.2)	126 (37.1)			35 (37.6)	124 (37.1)	
>24 weeks		8 (9.0)	41 (12.1)			12 (12.9)	37 (11.1)	
Fruit and Vegetable Intake Age 4 (g/day) Mean (SD)	376	223.4 (114.2)	209.2 (103.6)	0.2918 ^a	374	200.2 (108.2)	215.0 (102.7)	0.2509 ^a
Lutein and Zeaxanthin Intake Age 4 (mg/day) Mean (SD)	376	0.94 (0.47)	0.91 (0.46)	0.6718 ^a	374	0.90 (0.44)	0.92 (0.55)	0.7750 ^a
Vision Covariates								
Parental History of Eye Disease ^d n (%)								
None	421	14 (15.9)	71 (21.3)	0.004 ^b	419	16 (17.4)	68 (20.8)	0.461 ^b
One Parent		28 (31.8)	152 (45.7)			37 (40.2)	143 (43.7)	
Both parents		46 (52.3)	110 (33.0)			39 (42.4)	116 (35.5)	

Childhood history of eye disease ^d n (%)								
No	422	34 (38.6)	297 (88.9)	P<0.0001 ^b	420	70 (75.3)	261 (79.8)	0.344 ^b
Yes		54 (61.4)	37 (11.1)			23 (24.7)	66 (20.18)	
Age at Eye Test (years)								
Mean (SD)	430	11.1 (0.5)	11.2 (0.5)	0.3569 ^a	428	11.1 (0.5)	11.2 (0.5)	0.3479 ^a

^a – p-value from t-test between groups ^b – p-value from CHI Squared Test ^c – p-value from Fisher Exact Test ^d – Includes any reported ametropia but excluding presbyopia.

Table S4. Results of Wald test for interaction between lutein and zeaxanthin intake tertiles and selected covariates within multiple regression Model C.

	Contrast Sensitivity Model C	Visual Acuity Model C
Week 12	p-value for interaction	p-value for interaction
Social class	0.1571	0.4506
Breastfeeding	0.8683	0.0648
Parity	0.2759	0.3267
Sex	0.2260	0.6241
Week 32		
Social class	0.8121	0.4059
Breastfeeding	0.5159	0.8075
Parity	0.0052	0.0254
Sex	0.7227	0.4381