Supplemental Materials

Adiposity Measurement

The child's height was measured using a stadiometer to the nearest 0.1 cm, and weight was measured using a calibrated digital scale to the nearest 0.1 kg. BMI (kg/m^2) and BMI z-scores (BMI-z) (age- and sex-specific standard deviation scores) were calculated. Waist and hip circumferences were measured three separate times to the nearest 0.1 cm. Waist circumference was measured at the center point between the iliac crest and lower costal margin in the midaxillary line. Hip circumference was measured around the maximum circumference of the buttocks. Waist to height ratio (WtHR) was calculated as waist measurement divided by height measurement (in cm), and waist to hip ratio (WHR) was calculated as waist measurement divided by hip measurement (in cm). Percent body fat was measured by a trained staff member using bioelectrical impedance (Tanita Corporation of America, Inc).

Food cue task in the scanner

Briefly, children were required to watch attentively during the task where they were presented food and non-food cues. A randomized block design was used with a total of 12 blocks of stimuli. There were three colorful photographs in each block, and each picture was presented for 4 s with 1 s waiting time between photographs, resulting in a total of 3 min and 16 s total running time. Food cues consisted of palatable food items such as French fries and cupcakes, and non-food cues consisted of neutral pictures such as books and rulers. Pictures were selected after pilot testing in studies conducted in children within the same age range. Only food pictures that were rated as 'appealing' and 'familiar' and only the non-food pictures

that were rated as ‘familiar’ were included in the fMRI studies. Thirty-two 4mm thick slices that cover the whole brain were acquired during the food cue task.

fMRI analysis

Among 159 children enrolled in the study, 57 participants were excluded from the imaging data analysis for the following reasons: 32 due to participant contraindications or unwillingness to undergo magnetic resonance imaging (MRI) scanning, 18 due to high levels of motion (≥2 mm movement in any direction), 6 due to technical issues during scan collection, and 1 due to abnormal brain findings identified by neurologist. Collected fMRI data were preprocessed and analyzed using the fMRI Expert Analysis Tool (FEAT) version 6.0 provided within the FMRIB Software Library (FSL) toolkit, from the team at the Oxford University Centre for Functional MRI (https://fsl.fmrib.ox.ac.uk/fsl/). First, the raw functional data were preprocessed using the lower level FEAT analysis tool, which included standard preprocessing adjustments such as motion correction, BET brain extraction, and spatial smoothing with a full-width at half-maximum Gaussian kernel of 5 mm. The high-resolution structural scan acquired from each participant was included in this step for native space mapping, in addition to being registered into standard space using affine transformation to the Montreal Neurological Institute T1-weighted 2-mm brain template with 12 degrees of freedom, provided through FSL’s FLIRT. Secondly, to further correct for possible motion artifacts, these data were processed through the ICA-AROMA workflow, which uses Independent Component Analysis to remove noise components. For a more detailed description of these processing steps, please refer to Pruim et al. (2015). Each individual’s ‘cleaned’ data were used as inputs for first level FEAT analysis. High-pass temporal filtering was applied (100s), and the food and non-food events were added to the General Linear Model

(GLM) after convolution with a canonical hemodynamic response function (HRF). We also included motion confounds generated using fsl_motion_outliers in the GLM as regressors of no interest. For each subject, food versus non-food cue contrast maps were created through the lower level analysis, and then fed into a random-effects group-level analysis using FMRIB's Local Analysis of Mixed Effects (FLAME1).

Table 1: Subject Characteristics included in final imaging analysis

Characteristics	Overall (N = 102)	GDM (N = 53)	Unexposed (N = 49)	*P*
Child				
Age	8.6 (0.98)	8.4 (0.84)	8.8 (1.09)	**0.04**
Sex				0.26
Female	64 (62.7)	36 (67.9)	28 (57.1)	
Male	38 (37.3)	17 (32.1)	21 (42.9)	
Tanner Staging				0.94
1	90 (88.2)	47 (88.7)	43 (87.8)	
2	8 (7.8)	4 (7.5)	4 (8.2)	
3	3 (2.9)	2 (3.8)	1 (2.0)	
4	1 (1.0)	0 (0.0)	1 (2.0)	
BMI (kg/m^2)	19.0 (4.11)	19.3 (4.56)	18.7 (3.58)	0.46
BMI Z score	0.8 (1.07)	0.8 (1.12)	0.7 (1.01)	0.5
Total body fat (%)	25.4 (8.62)	26.4 (9.36)	24.3 (7.68)	0.24
Waist circumference (cm)	64.8 (11.2)	65.2 (11.7)	64.4 (10.7)	0.74
Hip circumference (cm)	73.8 (9.82)	73.5 (10.39)	74.2 (9.27)	0.73
Height (cm)	133.1 (9.4)	131.9 (8.4)	134.4(10.2)	0.17
Waist-to-hip ratio	0.87 (0.06)	0.88 (0.06)	0.86 (0.06)	0.1
Waist-to-height ratio	0.49 (0.07)	0.49 (0.07)	0.48 (0.06)	0.26
Maternal				
Pre-pregnancy BMI Group				0.71
Normal-weight (BMI < 25 kg/m^2)	26 (25.5)	15 (28.3)	11 (22.4)	
Overweight (BMI ≥ 25 and < 30kg/m^2)	32 (31.4)	17 (32.1)	15 (30.6)	
Obese (BMI ≥ 30 kg/m^2)	44 (43.1)	21 (39.6)	23 (46.9)	
Race/Ethnicity				0.59
Hispanic	55 (53.9)	31 (58.5)	24 (49.0)	
Non-Hispanic Black	15 (14.7)	7 (13.2)	8 (16.3)	
Non-Hispanic White	20 (19.6)	8 (15.1)	12 (24.5)	
Other	12 (11.8)	7 (13.2)	5 (10.2)	
Income group at birth ($)				0.38
Missing	2 (2.0)	0 (0.0)	2 (4.1)	
<30,000	17 (16.7)	6 (11.3)	11 (22.4)	
30,000-50,000	25 (24.5)	14 (26.4)	11 (22.4)	
50,000-70,000	31 (30.4)	19 (35.8)	12 (24.5)	
70,000-90,000	15 (14.7)	7 (13.2)	8 (16.3)	
≥90,000	12 (11.8)	7 (13.2)	5 (10.2)	
Maternal Education				0.45
Unknown	2 (2.0)	0 (0.0)	2 (4.1)	

High school or less	18 (17.6)	11 (20.8)	7 (14.3)
Some college	31 (30.4)	17 (32.1)	14 (28.6)
College and postgraduate	51 (50.0)	25 (47.2)	26 (53.1)

Data shown are either mean (SD) or *N* (%) depending on the measure in question.

Table 2: Subject characteristics for those included and excluded from final analysis

Characteristics	Included (N = 102)	Excluded (N = 57)	*P*
Child			
Age	8.6 (0.98)	8.4 (0.91)	0.37
Sex			0.41
Female	64 (62.7)	32 (56.1)	
Male	38 (37.3)	25 (43.9)	
Tanner Staging			0.73
1	90 (88.2)	54 (94.7)	
2	8 (7.8)	2 (3.5)	
3	3 (2.9)	1 (1.8)	
4	1 (1.0)	0 (0.0)	
BMI (kg/m^2)	19.0 (4.11)	19.2 (4.36)	0.81
BMI Z score	0.8 (1.07)	0.8 (1.17)	0.84
Total body fat (%)	25.4 (8.62)	25.5 (8.99)	0.91
Waist circumference (cm)	64.8 (11.2)	65.0 (11.16)	0.93
Hip circumference (cm)	73.8 (9.82)	74.0 (9.63)	0.93
Height (cm)	133.1 (9.35)	130.9 (7.32)	0.13
Waist-to-hip ratio	0.87 (0.06)	0.88 (0.06)	0.96
Waist-to-height ratio	0.49 (0.07)	0.50 (0.07)	0.42
Maternal			
Pre-pregnancy BMI Group			0.77
Normal-weight (BMI < 25 kg/m^2)	26 (25.5)	13 (22.8)	
Overweight (BMI ≥ 25 and < 30 kg/m^2)	32 (31.4)	16 (28.1)	
Obese (BMI ≥ 30 kg/m^2)	44 (43.1)	28 (49.1)	
Race/Ethnicity			0.25
Hispanic	55 (53.9)	37 (64.9)	
Non-Hispanic Black	15 (14.7)	6 (10.5)	
Non-Hispanic White	20 (19.6)	12 (21.1)	
Other	12 (11.8)	2 (3.5)	
Income group at birth ($)			0.42
Missing	2 (2)	0 (0)	
<30,000	17 (16.7)	8 (14.0)	
30,000-50,000	25 (24.5)	23 (40.4)	
50,000-70,000	31 (30.4)	15 (26.3)	
70,000-90,000	15 (14.7)	7 (12.3)	
≥90,000	12 (11.8)	4 (7.0)	
Maternal Education			0.17
Unknown	2 (2)	0 (0)	
High school or less	18 (17.6)	17 (29.8)	

Some college	31 (30.4)	19 (33.3)
College and postgraduate	51 (50.0)	21 (36.8)

Data shown are either mean (SD) or *N* (%) depending on the measure in question.

Table 3: Group difference of GDM vs. unexposed in daily energy intake in children with quality imaging data (N=102)

Model	GDM vs. unexposed	
	Beta (SE)*	**P**
Model 0	155.29 (67.6)	0.02
Model 1	182.88 (69.69)	0.01
Model 2	183.30 (70.09)	0.01
Model 3	171.83 (71.75)	0.02

Model 0: unadjusted
Model 1: adjusted for child's age, sex, maternal education and maternal race/ethnicity
Model 2: model 1+ maternal pre-pregnancy BMI
Model 3: model 2+ physical activity

* regression coefficient (SE) from linear regression models.

Table 4: Relationships between maternal exposure and the nucleus accumbens responses to food cues (relative to non-food cues)

Model	GDM vs. unexposed		Pre-Pregnancy BMI	
	Beta (SE)*	P	Beta (SE)*	P
Model 0	0.008 (0.027)	0.758	0.006 (0.010)	0.553
Model 1	0.004 (0.028)	0.895	0.002 (0.010)	0.865
Model 2	0.004 (0.028)	0.899	0.002 (0.010)	0.868
Model 3	-0.006 (0.028)	0.826	-0.003 (0.010)	0.98

Model 0: unadjusted
Model 1: adjusted for child's age, sex, maternal education and maternal race/ethnicity
Model 2: model 1+ maternal exposure (maternal pre-pregnancy BMI [for GDM exposures] or maternal GDM status as a 3 categorical variable [for pre-pregnancy BMI])
Model 3: model 2+ physical activity

* regression coefficient (SE) from linear regression models. For GDM related results, a positive beta means greater nucleus accumbens responses to food vs. non-food cues in the GDM group than unexposed group, whereas a negative beta means the opposite data pattern. For pre-pregnancy BMI related results, a positive beta means a positive relationship between pre-pregnancy BMI and nucleus accumbens responses to food vs. non-food cues, whereas a negative beta means a negative relationship.

Table 5: Relationships between maternal exposure and the amygdala responses to food cues (relative to non-food cues)

Model	GDM vs. unexposed		Pre-Pregnancy BMI	
	Beta (SE)*	P	Beta (SE)*	P
Model 0	-0.039 (0.032)	0.221	0.003 (0.012)	0.786
Model 1	-0.048 (0.033)	0.15	0.001 (0.012)	0.92
Model 2	-0.048 (0.033)	0.151	0.002 (0.012)	0.888
Model 3	-0.042 (0.034)	0.226	0.004 (0.012)	0.774

Model 0: unadjusted
Model 1: adjusted for child's age, sex, maternal education and maternal race/ethnicity
Model 2: model 1+ maternal exposure (maternal pre-pregnancy BMI [for GDM exposures] or maternal GDM status as a 3 categorical variable [for pre-pregnancy BMI])
Model 3: model 2+ physical activity

* regression coefficient (SE) from linear regression models. For GDM related results, a positive beta means greater amygdala responses to food vs. non-food cues in the GDM group than unexposed group, whereas a negative beta means the opposite data pattern. For pre-pregnancy BMI related results, a positive beta means a positive relationship between pre-pregnancy BMI and amygdala responses to food vs. non-food cues, whereas a negative beta means a negative relationship.

Table 6: Relationships between maternal exposure and the dorsal striatum responses to food cues (relative to non-food cues)

Model	GDM vs. unexposed		Pre-Pregnancy BMI	
	Beta (SE)*	P	Beta (SE)*	P
Model 0	-0.0002 (0.024)	0.993	0.005 (0.009)	0.582
Model 1	-0.008 (0.025)	0.735	0.003 (0.009)	0.757
Model 2	-0.009 (0.025)	0.729	0.003 (0.009)	0.751
Model 3	-0.010 (0.026)	0.689	0.003 (0.009)	0.759

Model 0: unadjusted
Model 1: adjusted for child's age, sex, maternal education and maternal race/ethnicity
Model 2: model 1+ maternal exposure (maternal pre-pregnancy BMI [for GDM exposures] or maternal GDM status as a 3 categorical variable [for pre-pregnancy BMI])
Model 3: model 2+ physical activity

* regression coefficient (SE) from linear regression models. For GDM related results, a positive beta means greater dorsal striatum responses to food vs. non-food cues in the GDM group than unexposed group, whereas a negative beta means the opposite data pattern. For pre-pregnancy BMI related results, a positive beta means a positive relationship between pre-pregnancy BMI and dorsal striatum responses to food vs. non-food cues, whereas a negative beta means a negative relationship.

Table 7: Relationships between maternal exposure and the insular cortex responses to food cues (relative to non-food cues)

Model	GDM vs. unexposed		Pre-Pregnancy BMI	
	Beta (SE)*	P	Beta (SE)*	P
Model 0	-0.006 (0.028)	0.833	-0.008 (0.010)	0.404
Model 1	-0.016 (0.029)	0.573	-0.012 (0.011)	0.27
Model 2	-0.016 (0.029)	0.593	-0.011 (0.010)	0.278
Model 3	-0.015 (0.030)	0.62	-0.011 (0.011)	0.288

Model 0: unadjusted
Model 1: adjusted for child's age, sex, maternal education and maternal race/ethnicity
Model 2: model 1+ maternal exposure (maternal pre-pregnancy BMI [for GDM exposures] or maternal GDM status as a 3 categorical variable [for pre-pregnancy BMI])
Model 3: model 2+ physical activity

* regression coefficient (SE) from linear regression models. For GDM related results, a positive beta means greater insular cortex responses to food vs. non-food cues in the GDM group than unexposed group, whereas a negative beta means the opposite data pattern. For pre-pregnancy BMI related results, a positive beta means a positive relationship between pre-pregnancy BMI and insular cortex responses to food vs. non-food cues, whereas a negative beta means a negative relationship.

Table 8: Regions and coordinates for significant clusters of food vs. non-food cues from whole brain analysis (N=102)

Region	MNI Coordinates (mm)*	Z-max
Right Amygdala	16, -4, -20	7.24
Left Insular Cortex	-34, 2, -12	6.9
Right Insular Cortex	38, -6, 10	6.77
Left Amygdala/Caudate/Nucleus Accumbens	-16, -4, -20	6.76
Left OFC	-24, 30, -14	6.64
Right Supramarginal Gyrus, Anterior Division	62, -20, 32	6.38
Left Supramarginal Gyrus, Anterior Division	-62, -26, 30	6.14
Lateral Occipital Cortex, Inferior Division	-44, -72, -4	6.08
Thalamus	0, -16, 10	5.42
Right Inferior Temporal Gyrus, Temporooccipital Division	46, -56, -4	5.18
Right OFC	22, 28, -16	4.77
Left Occipital Pole	-18, -94, 16	4.63
Cingulate Gyrus, Anterior Division	-6, 36, 4	4.46
Left Frontal Pole	-32, 38, 18	4.34
Left Inferior Temporal Gyrus, Temporooccipital Division	-42, -46, -10	4.19
Cingulate Gyrus, Posterior Division	-10, -52, 30	4.08

* Coordinates are listed in the x, y, and z directions, respectively.

Table 9. Relationships between maternal exposure and BMI-z

Model	GDM vs. unexposed		Pre-Pregnancy BMI	
	Beta (SE)*	**P**	**Beta (SE)***	**P**
Model 0	0.22 (0.17)	0.206	0.17 (0.06)	**0.004**
Model 1	0.21 (0.18)	0.249	0.17 (0.06)	**0.005**
Model 2	0.15 (0.18)	0.395	0.16 (0.06)	**0.007**

Model 0: unadjusted
Model 1: adjusted for child's age, sex, maternal education and maternal race/ethnicity
Model 2: model 1+ maternal exposure (maternal pre-pregnancy BMI [for GDM exposures] or maternal GDM status as a 3 categorical variable [for pre-pregnancy BMI])

* regression coefficient (SE) from linear regression models. For GDM related results, a positive beta means greater BMI-z in the GDM group than unexposed group, whereas a negative beta means the opposite data pattern. For pre-pregnancy BMI related results, a positive beta means a positive relationship between pre-pregnancy BMI and BMI-z, whereas a negative beta means a negative relationship.

Table 10. Relationships between maternal exposure and % body fat

Model	GDM vs. unexposed		Pre-Pregnancy BMI	
	Beta (SE)*	**P**	**Beta (SE)***	**P**
Model 0	2.25 (1.39)	0.107	0.97 (0.46)	**0.038**
Model 1	2.08 (1.41)	0.144	0.94 (0.47)	**0.047**
Model 2	1.78 (1.41)	0.21	0.87 (0.47)	0.066

Model 0: unadjusted
Model 1: adjusted for child's age, sex, maternal education and maternal race/ethnicity
Model 2: model 1+ maternal exposure (maternal pre-pregnancy BMI [for GDM exposures] or maternal GDM status as a 3 categorical variable [for pre-pregnancy BMI])

* regression coefficient (SE) from linear regression models. For GDM related results, a positive beta means greater % body fat in the GDM group than unexposed group, whereas a negative beta means the opposite data pattern. For pre-pregnancy BMI related results, a positive beta means a positive relationship between pre-pregnancy BMI and % body fat, whereas a negative beta means a negative relationship.

Table 11. Relationships between maternal exposure and waist to height ratio

Model	GDM vs. unexposed		Pre-Pregnancy BMI	
	Beta (SE)*	**P**	**Beta (SE)***	**P**
Model 0	0.024 (0.012)	**0.028**	0.012 (0.004)	**0.001**
Model 1	0.021 (0.011)	0.064	0.012 (0.004)	**0.002**
Model 2	0.017 (0.011)	0.123	0.012 (0.004)	**0.003**

Model 0: unadjusted
Model 1: adjusted for child's age, sex, maternal education and maternal race/ethnicity
Model 2: model 1+ maternal exposure (maternal pre-pregnancy BMI [for GDM exposures] or maternal GDM status as a 3 categorical variable [for pre-pregnancy BMI])

* regression coefficient (SE) from linear regression models. For GDM related results, a positive beta means greater waist to height ratio in the GDM group than unexposed group, whereas a negative beta means the opposite data pattern. For pre-pregnancy BMI related results, a positive beta means a positive relationship between pre-pregnancy BMI and waist to height ratio, whereas a negative beta means a negative relationship.

Table 12. Relationships between maternal exposure and waist to hip ratio

Model	GDM vs. unexposed		Pre-Pregnancy BMI	
	Beta (SE)*	**P**	**Beta (SE)***	**P**
Model 0	0.023 (0.009)	**0.012**	0.009 (0.003)	**0.005**
Model 1	0.020 (0.009)	**0.035**	0.008 (0.003)	**0.009**
Model 2	0.017 (0.009)	0.064	0.008 (0.003)	**0.016**

Model 0: unadjusted
Model 1: adjusted for child's age, sex, maternal education and maternal race/ethnicity
Model 2: model 1+ maternal exposure (maternal pre-pregnancy BMI [for GDM exposures] or maternal GDM status as a 3 categorical variable [for pre-pregnancy BMI])

* regression coefficient (SE) from linear regression models. For GDM related results, a positive beta means greater waist to hip ratio in the GDM group than unexposed group, whereas a negative beta means the opposite data pattern. For pre-pregnancy BMI related results, a positive beta means a positive relationship between pre-pregnancy BMI and waist to hip ratio, whereas a negative beta means a negative relationship.

Figure 1: Overview of study design

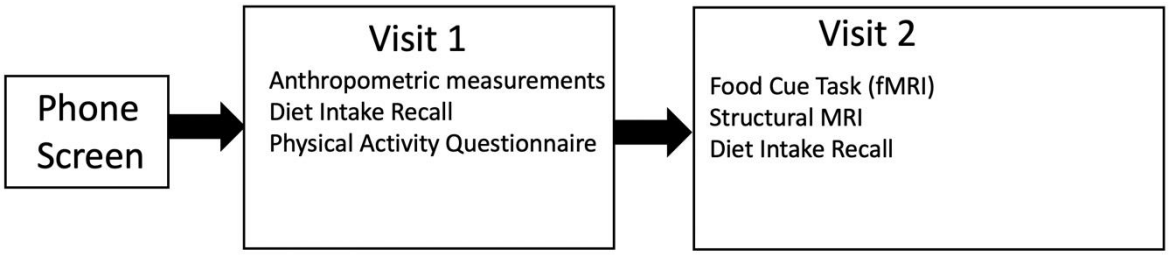

Figure 2: Image of significant clusters from representative slices that showed greater activity during viewing of food vs non-food cues from a whole brain analysis (adjusted for multiple comparisons using Z>3.1, *p*<.05)