UAE Medical and Behavioral Paper 1

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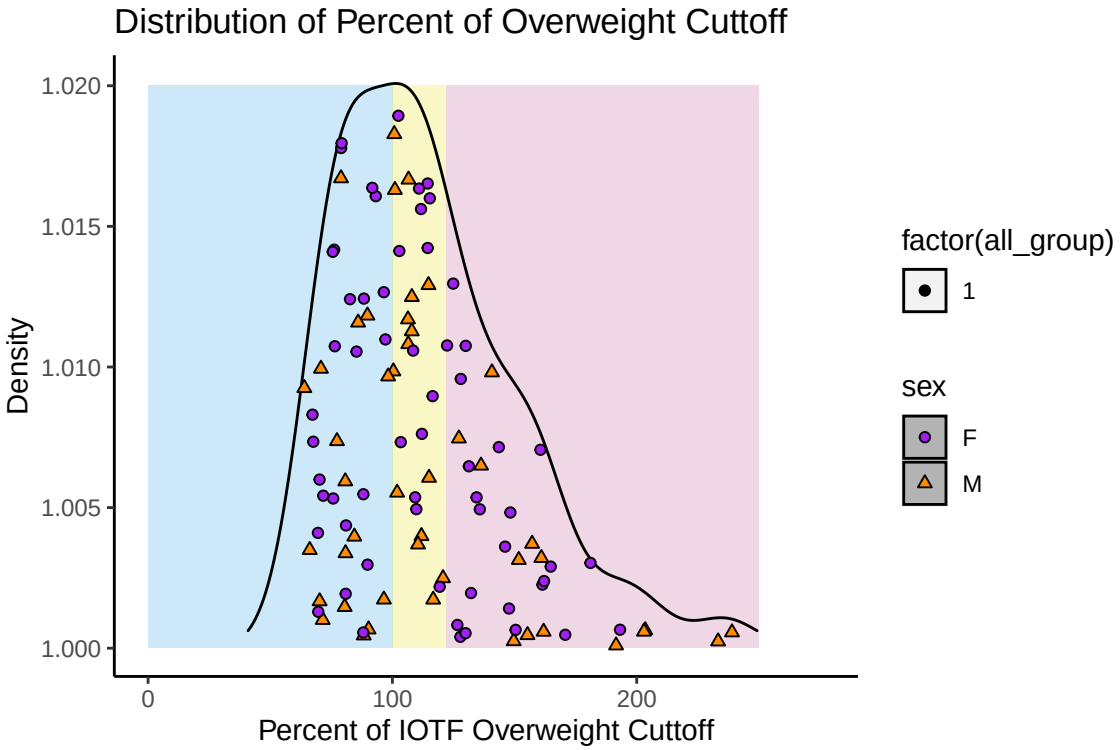
1 Measurement of Weight Status

We decided to use the International Obesity Task Force (IOTF) designation of weight status for the sample. They use smoothed, sex-specific BMI curves meant to match the the BMI cutoffs for overweight (OW; 25 kg/m^2) and obesity (OB; 30 kg/m^2) at age 18 yrs.

Rather than BMI-zscore or BMI-percentile, we chose to use percent of overweight cutoff because recent studies shows it has a tighter association with measured adiposity:

BMI % of overweight = $\frac{childBMI}{BMI\ at\ age-\ and\ sex-\ adjusted\ overweight\ cutoff} * 100$

<100 % - indicates child BMI is below the overweight cutoff for age and sex (i.e., has healthy weight) 100 % - indicates child BMI is the same as the overweight cutoff for age and sex >100 % - indicates child BMI is above the overweight cutoff for age and sex (i.e., has overweight or obesity)



Density plot of percent of overweight by sex. The shaded regions indicated those with healthy weight (blue), overweight (yellow), and obesity (red). The points show denisity of participants by sex (purple circles = female, orange triangles = males).

2 Participant Characteristics

Table 1: Demographic Characteristics by Weight Status

Characteristic	N	HW, N = 41	OW, N = 29	OB, N = 37
sex	107			
F		24 (59%)	14 (48%)	23 (62%)
M		17 (41%)	15 (52%)	14 (38%)
Age_yr	107	11.85 [8.02 - 17.37]	12.84 [8.15 - 17.54]	13.69 [7.31 - 17.84]
BMI	107	17.15 [12.71 - 22.72]	24.03 [18.70 - 28.86]	35.08 [21.87 - 55.52]
IOTF_pOWcutoff	107	80.86 [63.95 - 98.26]	109.66 [100.39 - 120.73]	155.80 [122.38 - 239.00]
Father_ed	102	12.79 [6.00 - 18.00]	13.60 [6.00 - 18.00]	12.20 [0.00 - 18.00]
Unknown		3	0	2
Mother_ed	99	13.38 [3.00 - 18.00]	13.93 [9.00 - 18.00]	12.40 [0.00 - 18.00]
Unknown		4	2	2
Month_AED	99			
<25,000 AED		10 (27%)	10 (34%)	11 (33%)
25,000 - 55,000 AED		21 (57%)	13 (45%)	19 (58%)
55,000 - 75,000 AED		2 (5.4%)	3 (10%)	1 (3.0%)
> 75,000 AED		4 (11%)	3 (10%)	2 (6.1%)
Unknown		4	0	4
DadNationality	101			
Emirati		40 (100%)	25 (96%)	33 (94%)
Omani		0 (0%)	1 (3.8%)	0 (0%)
Yemeni		0 (0%)	0 (0%)	2 (5.7%)
Unknown		1	3	2
MomNationality	104			
Emirati		38 (93%)	26 (93%)	32 (91%)
Omani		0 (0%)	1 (3.6%)	0 (0%)
Yemeni		0 (0%)	0 (0%)	1 (2.9%)
Moroccan		1 (2.4%)	0 (0%)	1 (2.9%)
Egyptian		2 (4.9%)	0 (0%)	1 (2.9%)
Bahrani		0 (0%)	1 (3.6%)	0 (0%)
Unknown		0	1	2

[1] n (%); Mean [Range]

2.1 Associations between Demographics and Percent of Overweight Cutoff

2.1.1 t-test for sex

```
    Welch Two Sample t-test

data:  IOTF_pOWcutoff by sex
t = -0.72449, df = 78.92, p-value = 0.4709
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -20.558399   9.586342
sample estimates:
mean in group F mean in group M
       112.2213        117.7073
```

2.1.2 Correlation Matrix

Table 2: Correlations between percent of overweight cuttoff and demographic characteristics

	Age_yr	Father_ed	Mother_ed	IOTF_pOWcutoff
Age_yr				
Father_ed	-0.02			
Mother_ed	-0.2*	0.51*		
IOTF_pOWcutoff	0.26*	-0.07	-0.15	

Table 3: P-vales for the correlations between percent of overweight cuttoff and demographic characteristics

	Age_yr	Father_ed	Mother_ed	IOTF_pOWcutoff
Age_yr				
Father_ed	0.806			
Mother_ed	0.049	0		
IOTF_pOWcutoff	0.006	0.491	0.131	

Only child age was associated with percent of overweight cutoff - older children tended to have higher percent of overweight cutoff indicating older children were more likely to have overweight or obesity. There was no association with father or mother education level, which differs from finding in the US. Hip to waist ratio was also not associated with percent of overweight cutoff.

2.1.3 One-Way ANOVA for Income Categories

```
Anova Table (Type III tests)

Response: IOTF_pOWcutoff
            Sum Sq Df  F value Pr(>F)
(Intercept) 406511  1 282.6340 <2e-16 ***
Month_AED     1046  3   0.2424 0.8665
Residuals   136638 95
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

There was no difference in percent of overweight by monthly income category.

2.1.4 Sensitivity Tests

Table 4: Linear Model: pOWcutoff - SES category + Maternal Education + Age + Sex

	b	se	t	p	
(Intercept)	71.310	27.957	2.551	0.012	
Month_AED25,000 - 55,000 AED	9.699	8.663	1.120	0.266	
Month_AED55,000 - 75,000 AED	19.268	16.747	1.150	0.253	
Month_AED> 75,000 AED	2.047	15.847	0.129	0.898	
Mother_ed	-1.654	1.254	-1.319	0.191	
Age_yr	4.239	1.464	2.894	0.005	***
sexM	10.293	7.621	1.351	0.180	

After controlling for family income, mother education, and child sex, child age was significantly associated with percent of overweight such that for each year older, the expected percent of overweight is predicted to increase 4.24%.

3 Medical Comorbidities

Table 5: Medical Comorbidites by Weight Status

Characteristic	N	HW, N = 41	OW, N = 29	OB, N = 37
nComorbid	107	2.05 [0.00 - 4.00]	2.24 [1.00 - 4.00]	2.19 [0.00 - 4.00]
VitDdeficiency	107			
Y		36 (88%)	29 (100%)	33 (89%)
N		5 (12%)	0 (0%)	4 (11%)
Anemia	40			
Iron Deficiency Anemia (ID)		9 (39%)	7 (70%)	5 (71%)
Thalassemia Minor (TM)		2 (8.7%)	1 (10%)	0 (0%)
G6PD Deficiency		1 (4.3%)	0 (0%)	0 (0%)
ID + TM		1 (4.3%)	1 (10%)	0 (0%)
ID + G6PD Deficiency		1 (4.3%)	0 (0%)	0 (0%)
Unspecified Anemia		9 (39%)	1 (10%)	2 (29%)
Unknown		18	19	30
Hyperlipidemia	12			
Hyperlipidemia		0 (NA%)	5 (100%)	6 (86%)
Hyperlipidemia - Mixed		0 (NA%)	0 (0%)	1 (14%)
Unknown		41	24	30
ThyroidConditions	25			
Abnormal Function		5 (71%)	4 (44%)	5 (56%)
Autoimmune Thyroiditis		1 (14%)	2 (22%)	2 (22%)
Autoimmune Hypothyroidism		0 (0%)	0 (0%)	0 (0%)
Unspecified Hypothyroidism		1 (14%)	2 (22%)	2 (22%)
Goiter		0 (0%)	1 (11%)	0 (0%)
Unknown		34	20	28
GlycemicStatus	28			
Impaired Fasting Glucose		4 (57%)	8 (73%)	7 (70%)
Impaired Glucose Tolerance Test		2 (29%)	2 (18%)	3 (30%)
Type-1 Diabetes		1 (14%)	1 (9.1%)	0 (0%)
Unknown		34	18	27
Acanthosis Nigricans	8	1 (100%)	0 (NA%)	7 (100%)
Unknown		40	29	30
Hypertension	3			
Essential Primary Hypertension		0 (NA%)	0 (NA%)	2 (67%)
High Blood Pressure		0 (NA%)	0 (NA%)	1 (33%)
Unknown		41	29	34
Metabolic Syndrome	2	1 (100%)	0 (NA%)	1 (100%)
Unknown		40	29	36
Growth.Stature	10			
Failure To Thrive (FT)		1 (14%)	0 (0%)	0 (0%)
Growth Hormone Deficency		1 (14%)	0 (0%)	0 (0%)
Short Stature		3 (43%)	1 (100%)	2 (100%)
FT + ShortStature + Underweight		1 (14%)	0 (0%)	0 (0%)
Short Stature + Precocious Puberty		1 (14%)	0 (0%)	0 (0%)
Unknown		34	28	35
PCOS	4			
PCOS		1 (50%)	0 (NA%)	1 (50%)
Hirsutism		0 (0%)	0 (NA%)	1 (50%)
Hirsutism + Unspecified Ovarian Cysts		1 (50%)	0 (NA%)	0 (0%)
Unknown		39	29	35

[1] Mean [Range]; n (%)

3.1 Number of Comorbidites

3.1.1 mean (sd) number of comorbidites

```
[1] 2.149533
```

```
[1] 1.035263
```

3.1.2 Correlation with Number of Comorbidities

```
    Pearson's product-moment correlation

data:  UAE_allDat$IOTF_pOWcutoff and UAE_allDat$nComorbid
t = 0.74423, df = 105, p-value = 0.4584
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.1190571  0.2587387
sample estimates:
       cor
0.07243876
```

There was no association between percent of overweight cutoff and number of comorbidities

3.1.3 sex differences in number of comorbidites

```
    Welch Two Sample t-test

data:  nComorbid by sex
t = 1.125, df = 101.31, p-value = 0.2632
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.1710783  0.6194034
sample estimates:
mean in group F mean in group M
       2.245902        2.021739
```

```
        F         M
1.0747982 0.9772781
```

3.2 Distribution tests by Weight Status

3.2.1 Vitamin D

```
    Fisher's Exact Test for Count Data

data:  xtabs(~VitDdeficiency + IOTF_3class, data = UAE_allDat)
p-value = 0.132
alternative hypothesis: two.sided
```

3.2.2 Anemia

Table 6: Anemia Status by Weight Status

	HW	OW	OB
N	18	19	30
Y	23	10	7

```
    Pearson's Chi-squared test

data:  xtabs(~as.factor(ifelse(is.na(UAE_allDat$Anemia), "N", "Y")) +     IOTF_3class, data = UAE_allDa
X-squared = 11.627, df = 2, p-value = 0.002986
```

3.2.3 Hyperlipidemia

Table 7: Hyperlipidemia Status by Weight Status

	HW	OW	OB
N	41	24	30
Y	0	5	7

```
    Fisher's Exact Test for Count Data

data:
p-value = 0.004283
alternative hypothesis: two.sided
```

3.2.4 Thyroid Conditions

```
    Pearson's Chi-squared test

data:  xtabs(~as.factor(ifelse(is.na(UAE_allDat$ThyroidConditions),     "N", "Y")) + IOTF_3class, data =
X-squared = 1.8782, df = 2, p-value = 0.391
```

3.2.5 Glycemic Status

```
    Pearson's Chi-squared test

data:  xtabs(~as.factor(ifelse(is.na(UAE_allDat$GlycemicStatus), "N",     "Y")) + IOTF_3class, data = U
X-squared = 3.8464, df = 2, p-value = 0.1461
```

3.3 Association between Comorbidities and Percent of Overweight Cutoff

3.3.1 t-tests for Presence/Absence of Comorbidities

Table 8: t-tests for percent of overweight by absence vs presence of medical comorbidity

	AbsentMean	PresentMean	t	df	pvalue	sig
VitD Deficiency	114.56	114.84	-0.02	9.25	0.984	
Anemia	122.62	101.12	3.01	81.89	0.004	**
Thyroid Dysfunction	113.40	118.44	-0.59	39.42	0.559	
Glycemic Status	112.51	120.43	-0.86	39.25	0.393	

Table 9: Standard deviations for percent of overweight by absence vs presence of anemia

	x
N	35.677
Y	35.828

There were no difference in percent of overweight cutoff by presence/absence of Thyroid dysfunction or impaired glucose function. However, those with anemia tended to have lower percent of overweight. The mean with anemia was 101% indicating children were overweight on average. The mean for those without anemia were 123%, indicating the children were above the overweight cutoff.

4 Family History

Table 10: Family History by Weight Status

Characteristic	N	HW, N = 41	OW, N = 29	OB, N = 37
Fam_OB_YN	101			
yes		18 (49%)	21 (72%)	31 (89%)
no		19 (51%)	8 (28%)	4 (11%)
Unknown		4	0	2
nFam_Obesity	107	1.15 [0.00 - 6.00]	1.59 [0.00 - 4.00]	2.70 [0.00 - 7.00]
Mother	107	5 (12%)	2 (6.9%)	11 (30%)
Father	107	6 (15%)	4 (14%)	11 (30%)
Grandmother	107	11 (27%)	9 (31%)	13 (35%)
Grandfather	107	0 (0%)	2 (6.9%)	4 (11%)
Sister	107	5 (12%)	3 (10%)	8 (22%)
Brother	107	5 (12%)	3 (10%)	17 (46%)
Aunt	107	10 (24%)	17 (59%)	18 (49%)
Uncle	107	5 (12%)	6 (21%)	18 (49%)
Fam_ED_YN	96			
yes		2 (5.6%)	5 (19%)	4 (12%)
no		34 (94%)	22 (81%)	29 (88%)
Unknown		5	2	4
nFam_EatingDisorder	107	0.05 [0.00 - 1.00]	0.28 [0.00 - 2.00]	0.35 [0.00 - 7.00]
Mother	107	0 (0%)	0 (0%)	1 (2.7%)
Father	107	0 (0%)	0 (0%)	2 (5.4%)
Grandmother	107	1 (2.4%)	1 (3.4%)	2 (5.4%)
Grandfather	107	0 (0%)	1 (3.4%)	1 (2.7%)
Sister	107	1 (2.4%)	1 (3.4%)	0 (0%)
Brother	107	0 (0%)	1 (3.4%)	1 (2.7%)
Aunt	107	0 (0%)	3 (10%)	4 (11%)
Uncle	107	0 (0%)	1 (3.4%)	2 (5.4%)

[1] n (%); Mean [Range]

4.1 Association with Yes/No Family History

4.1.1 t-tests for Yes/No History of Obesity

```
    Welch Two Sample t-test

data:  IOTF_pOWcutoff by Fam_OB_YN
t = 4.828, df = 87.915, p-value = 5.776e-06
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 17.83736 42.79491
sample estimates:
mean in group yes  mean in group no
        125.08610          94.76996
```

Table 11: Standard deviations for percent of overweight by absence vs presence of family history of obesity

	x
yes	38.383
no	23.871

There was no differences in percent of overweight for those whose families had a history of eating disorder (reported by parent). There was a significant difference in percent of overweight between families that reported a history of obesity ('Yes') and those who did not ('No'). Those without a family history of obesity had a mean percent of overweight equal to 94%, indicating the children had healthy weight on average. Children with a family history of obesity had a mean percent of overweight equal to 124%, indicating the children had overweight or obesity.

4.1.2 distribution test for Yes/Now History of Eating Disorders across Weight Status

```
    Fisher's Exact Test for Count Data

data:  xtabs(~IOTF_3class + Fam_ED_YN, data = UAE_allDat)
p-value = 0.2633
alternative hypothesis: two.sided
```

4.2 Family Members with History of Obesity

Table 12: Overall Family Relationship Categories with History of Obeisty

Characteristic	N	N = 107
Mother	107	18 (17%)
Father	107	21 (20%)
Grandmother	107	33 (31%)
Grandfather	107	6 (5.6%)
Sister	107	16 (15%)
Brother	107	25 (23%)
Aunt	107	45 (42%)
Uncle	107	29 (27%)

[1] n (%)

4.2.1 mean (sd) number of family relationship categories

```
[1] 1.803738
```

```
[1] 1.750683
```

4.2.2 Correlations with Number of Relative Categories with History of Obesity

```
Pearson's product-moment correlation
```

data: UAE_allDat$nFam_Obesity and UAE_allDat$IOTF_pOWcutoff t = 4.8557, df = 105, p-value = 4.201e-06 alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: 0.2594553 0.5716059 sample estimates: cor 0.4282197

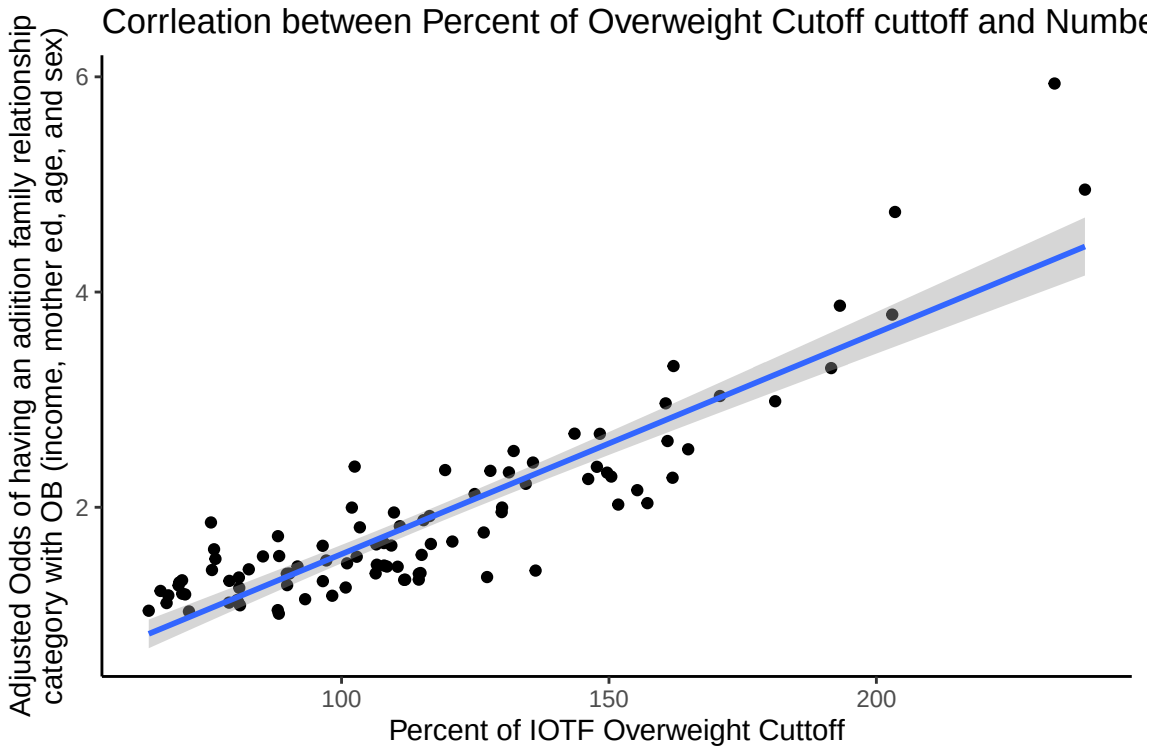
Percent of overweight cutoff was not associated with reported number of relative categories with an perceived to have had an eating disorder but was associated with family history of obesity.

4.2.3 Sensitivity Tests

Table 13: Linear Model: Peer Problems (raw) - SES category + Maternal Education + Age + Sex + pOWcutoff

	b	e^b	se	e^2.5 CI	e^97.5 CI	z	p	
(Intercept)	-0.180	0.835	0.577	0.266	2.558	-0.313	0.754	
Month_AED25,000 - 55,000 AED	0.113	1.120	0.182	0.788	1.610	0.622	0.534	
Month_AED55,000 - 75,000 AED	0.380	1.462	0.307	0.779	2.611	1.239	0.215	
Month_AED> 75,000 AED	-0.127	0.880	0.372	0.404	1.761	-0.342	0.732	
Mother_ed	-0.029	0.971	0.024	0.928	1.019	-1.221	0.222	
Age_yr	0.011	1.011	0.031	0.950	1.075	0.335	0.738	
sexM	-0.111	0.895	0.159	0.654	1.218	-0.703	0.482	
IOTF_pOWcutoff	0.008	1.008	0.002	1.005	1.012	4.360	0.000	***

After controlling for family income, mother education, child age, and child sex, percent of overweight showed a trend-level association with number of family members with history of obesity. A child with 110% of overweight, compared to 100%, would have 1.08 times the odds of having an additional family member with a history of obesity.



4.3 Family Members with History of Eating Disorders

Table 14: Overall Family Relationship Categories with History of Eating Disorders

Characteristic	N	N = 107
Mother	107	1 (0.9%)
Father	107	2 (1.9%)
Grandmother	107	4 (3.7%)
Grandfather	107	2 (1.9%)
Sister	107	2 (1.9%)
Brother	107	2 (1.9%)
Aunt	107	7 (6.5%)
Uncle	107	3 (2.8%)

[1] n (%)

4.3.1 mean (sd) number of family relationship categories

```
[1] 0.2149533
```

```
[1] 0.8358482
```

5 Sleep

Table 15: Sleep by Weight Status

Characteristic	N	HW	OW	OB	t-test	chi/fisher
Bedtime_cat	97					0.274
7 - 8 pm		11 (30%)	3 (12%)	6 (17%)		
9 pm		11 (30%)	7 (28%)	5 (14%)		
10 pm		9 (24%)	5 (20%)	10 (29%)		
11 - Midnight		3 (8.1%)	6 (24%)	9 (26%)		
After Midnight		3 (8.1%)	4 (16%)	5 (14%)		
Unknown		4	4	2		
Bed_hr	99	8.68 [2.00 - 11.50]	8.48 [5.00 - 12.00]	8.21 [6.00 - 11.00]	0.482	
Unknown		2	4	2		
CSHQ_BedtimeResit	94	7.77 [5.00 - 13.00]	6.91 [5.00 - 11.00]	7.19 [5.00 - 13.00]	0.297	
Unknown		6	6	1		
CSHQ_SleepOnsetDelay	100	1.51 [1.00 - 3.00]	1.62 [1.00 - 3.00]	2.09 [1.00 - 3.00]	0.009	
Unknown		2	3	2		
CSHQ_SleepDuration	99	4.55 [3.00 - 8.00]	4.52 [3.00 - 9.00]	4.89 [3.00 - 9.00]	0.620	
Unknown		3	4	1		
CSHQ_SleepAnxiety	98	6.13 [4.00 - 12.00]	5.76 [4.00 - 12.00]	5.14 [4.00 - 11.00]	0.208	
Unknown		3	4	2		
CSHQ_NightWaking_no16	96	2.89 [2.00 - 6.00]	2.75 [2.00 - 6.00]	3.09 [2.00 - 6.00]	0.598	
Unknown		3	5	3		
CSHQ_Parasomnias	93	8.67 [7.00 - 19.00]	8.58 [7.00 - 12.00]	9.21 [7.00 - 19.00]	0.495	
Unknown		5	5	4		
CSHQ_SleepDisorderBreathing	95	2.53 [2.00 - 7.00]	2.88 [2.00 - 6.00]	3.41 [2.00 - 7.00]	0.020	
Unknown		3	4	5		
CSHQ_DaytimeSleepiness	91	13.14 [6.00 - 22.00]	11.67 [7.00 - 18.00]	12.52 [6.00 - 19.00]	0.282	
Unknown		5	5	6		

[1] n (%); Mean [Range]

5.1 Association Betwen Sleep Sub-Scales and Percent of Overweight Cutoff

5.1.1 Correlation Matrix

Table 16: Correlations between sleep subscales and percent of overweight

	IOTF_pOWcutoff	Bed_hr	BedResit	OnsetDelay	Duration	Anxiety	NightWaking	Paras
IOTF_pOWcutoff								
Bed_hr	-0.09							
BedResit	-0.13	0.01						
OnsetDelay	0.31*	-0.11	0.13					
Duration	0.04	-0.34*	0.41*	0.4*				
Anxiety	-0.18	0.24*	0.62*	-0.1	0.02			
NightWaking	0.05	0.12	0.21	0.05	0.29*	0.23*		
Parasomnias	0.04	0.06	0.17	0.02	0.04	0.12	0.41*	
DisorderBreathing	0.32*	0.02	0.25*	0.04	0.07	0.19	0.36*	0.45*
DaySleepiness	-0.04	0.09	0.28*	0.16	0.21	0.28*	0.05	0.18

Examining correlations between sleep sub-scales and percent of overweight cutoff reveals greater percent of overweight cutoff was associated with greater parent reported sleep onset delay and sleep disordered breathing.

5.1.2 Sensitivity Tests

Table 17: Linear Model: Sleep Onset Delay - SES category + Maternal Education + Age + Sex + pOWcutoff

	b	se	t	p	
(Intercept)	0.076	0.683	0.111	0.912	
Month_AED25,000 - 55,000 AED	-0.031	0.205	-0.149	0.882	
Month_AED55,000 - 75,000 AED	-0.082	0.390	-0.210	0.834	
Month_AED> 75,000 AED	-0.122	0.409	-0.299	0.766	
Mother_ed	0.008	0.029	0.261	0.795	
Age_yr	0.073	0.036	2.010	0.048	*
sexM	0.128	0.184	0.697	0.488	
IOTF_pOWcutoff	0.006	0.003	2.126	0.037	*

5.1.2.1 Sleep Onset Delay After controlling for family income, mother education, child age, and child sex, percent of overweight was positively associated with sleep onset delay such that a child with 110% of overweight, compared to 100% of overweight, would be expected to have a sleep onset delay score that was 0.06 points higher (range of scores = 0 - 3). Additionally, age was positively associated with sleep onset delay such that each year older, the expected sleep disordered breathing score would be 0.12 points higher (range of scores = 0 - 7).

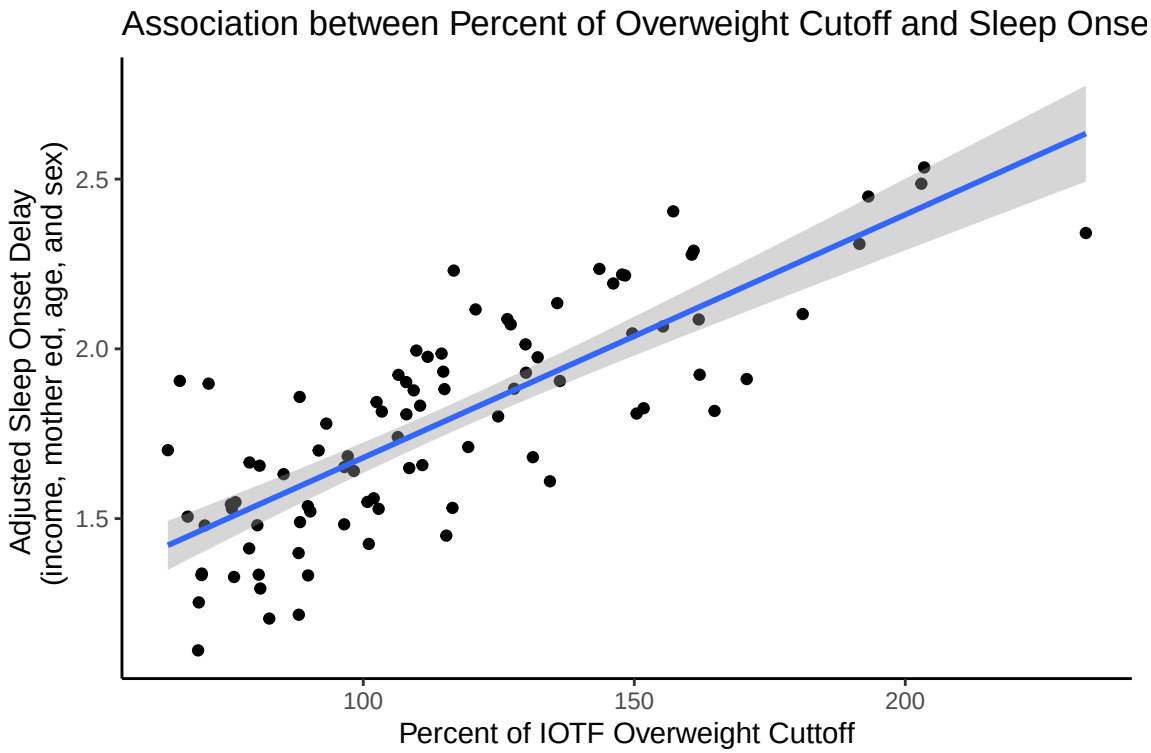
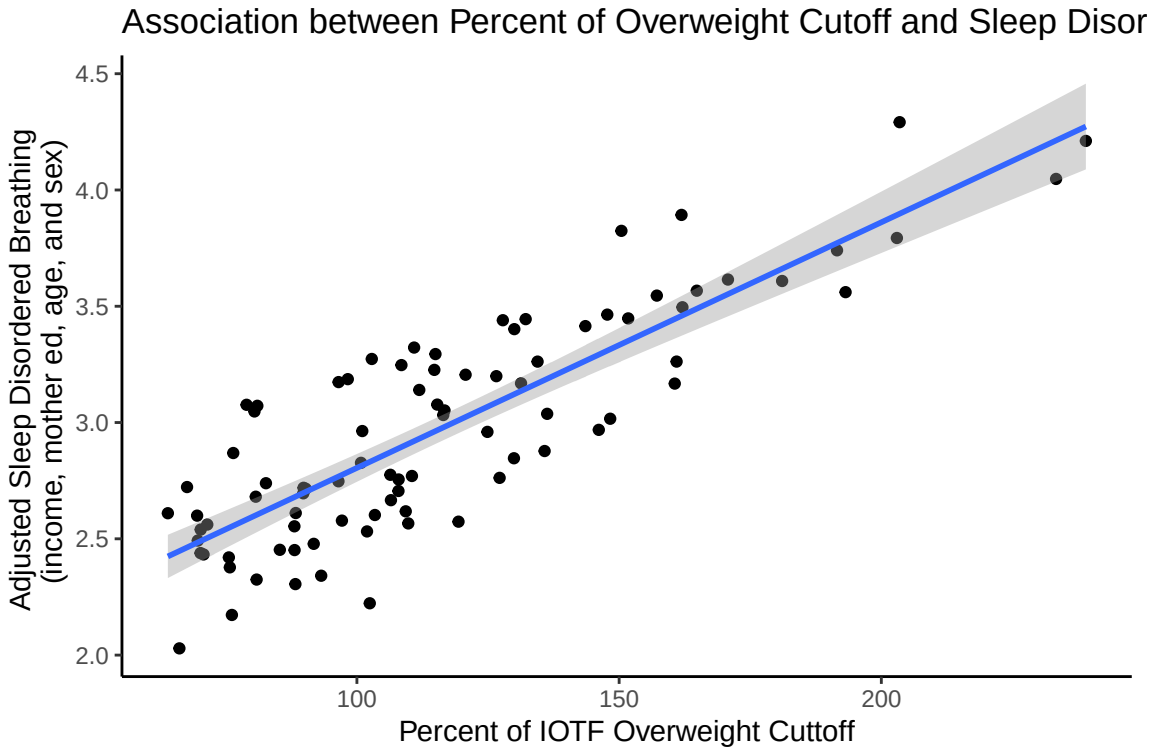


Table 18: Linear Model: Sleep Disordered Breathing - SES category + Maternal Education + Age + Sex + pOWcutoff

	b	se	t	p	
(Intercept)	2.812	1.077	2.610	0.011	
Month_AED25,000 - 55,000 AED	-0.435	0.334	-1.302	0.197	
Month_AED55,000 - 75,000 AED	-0.737	0.624	-1.182	0.241	
Month_AED> 75,000 AED	-0.457	0.693	-0.659	0.512	
Mother_ed	-0.012	0.047	-0.259	0.796	
Age_yr	-0.057	0.058	-0.970	0.335	
sexM	-0.001	0.298	-0.004	0.996	
IOTF_pOWcutoff	0.012	0.004	2.939	0.004	**

5.1.2.2 Sleep Disordered Breathing After controlling for family income, mother education, child age, and child sex, percent of overweight was positively associated with sleep disordered breathing such that a child with 110% of overweight, compared to 100% of overweight, would be expected to have a sleep disordered breathing score that was 0.12 points higher(range of scores = 2 - 7).


Association between Percent of Overweight Cutoff and Sleep Disor
Adjusted Sleep Disordered Breathing
(income, mother ed, age, and sex)
4.5
4.0
3.5
3.0
2.5
2.0
100
150
200
Percent of IOTF Overweight Cuttoff

6 Strengths and Difficulties Questionnaire

Table 19: Strengths and Difficulties by Weight Status

Characteristic	N	HW, N = 41	OW, N = 29	OB, N = 37
SDQ_EmotionProb_raw	104	3.05 [0.00 - 8.00]	3.00 [0.00 - 7.00]	3.43 [0.00 - 9.00]
Unknown		2	1	0
SDQ_ConductProb_raw	102	2.00 [0.00 - 7.00]	1.68 [0.00 - 5.00]	2.24 [0.00 - 6.00]
Unknown		1	1	3
SDQ_HyperactiveProb_raw	103	3.65 [0.00 - 9.00]	3.07 [0.00 - 10.00]	3.46 [0.00 - 10.00]
Unknown		2	2	0
SDQ_PeerProb_raw	102	2.71 [0.00 - 7.00]	2.97 [0.00 - 5.00]	3.46 [1.00 - 6.00]
Unknown		3	0	2
SDQ_Prosocial_raw	102	8.47 [4.00 - 10.00]	8.82 [6.00 - 10.00]	8.11 [2.00 - 10.00]
Unknown		2	1	2
SDQ_TotalProb_raw	106	11.11 [0.00 - 29.00]	10.34 [4.00 - 20.00]	12.22 [3.00 - 23.00]
Unknown		1	0	0
SDQ_TotalProb_cat	93			
CloseToAverage		27 (73%)	17 (68%)	19 (61%)
High		5 (14%)	2 (8.0%)	5 (16%)
SlightlyRaised		3 (8.1%)	5 (20%)	4 (13%)
VeryHigh		2 (5.4%)	1 (4.0%)	3 (9.7%)
Unknown		4	4	6
SDQ_EmotionProb_cat	104			
CloseToAverage		24 (62%)	18 (64%)	20 (54%)
High		7 (18%)	5 (18%)	7 (19%)
SlightlyRaised		5 (13%)	3 (11%)	6 (16%)
VeryHigh		3 (7.7%)	2 (7.1%)	4 (11%)
Unknown		2	1	0
SDQ_ConductProb_cat	102			
CloseToAverage		26 (65%)	21 (75%)	22 (65%)
High		7 (18%)	4 (14%)	7 (21%)
SlightlyRaised		6 (15%)	3 (11%)	4 (12%)
VeryHigh		1 (2.5%)	0 (0%)	1 (2.9%)
Unknown		1	1	3
SDQ_HyperactivityProb_cat	103			
CloseToAverage		29 (74%)	24 (89%)	32 (86%)
High		1 (2.6%)	0 (0%)	0 (0%)
SlightlyRaised		8 (21%)	1 (3.7%)	3 (8.1%)
VeryHigh		1 (2.6%)	2 (7.4%)	2 (5.4%)
Unknown		2	2	0
SDQ_PeerProb_cat	102			
CloseToAverage		17 (45%)	12 (41%)	11 (31%)
High		10 (26%)	9 (31%)	11 (31%)
SlightlyRaised		7 (18%)	6 (21%)	7 (20%)
VeryHigh		4 (11%)	2 (6.9%)	6 (17%)
Unknown		3	0	2
SDQ_Prosocial_cat	102			
CloseToAverage		30 (77%)	22 (79%)	25 (71%)
Low		2 (5.1%)	2 (7.1%)	1 (2.9%)
SlightlyLowered		5 (13%)	4 (14%)	6 (17%)
VeryLow		2 (5.1%)	0 (0%)	3 (8.6%)
Unknown		2	1	2

[1] Mean [Range]; n (%)

There were no differences by weight status.

6.1 Exploratory Sex x Percent of Overweight Models

6.1.1 Emotional Problems

Often complains of headaches

Many worries

Often unhappy, downhearted

Nervous or clingy in new situations

Many fears, easily scared

Table 20: Logistic Model: Emotional Problems (Elevated vs Not) - SES category + Maternal Education + Age + Sex + pOWcutoff

	b	e^b	se	e^2.5 CI	e^97.5 CI	z	p	
(Intercept)	0.554	1.740	1.740	0.057	5.520800e+01	0.318	0.750	
Month_AED25,000 - 55,000 AED	0.013	1.013	0.531	0.359	2.932000e+00	0.024	0.981	
Month_AED55,000 - 75,000 AED	0.369	1.446	1.049	0.155	1.134600e+01	0.351	0.725	
Month_AED> 75,000 AED	-16.635	0.000	1381.974	NA	3.271604e+40	-0.012	0.990	
Mother_ed	-0.006	0.994	0.076	0.856	1.158000e+00	-0.085	0.932	.
Age_yr	-0.102	0.903	0.098	0.740	1.092000e+00	-1.032	0.302	
sexM	-0.096	0.909	0.537	0.309	2.599000e+00	-0.178	0.858	
IOTF_pOWcutoff_c100	0.011	1.011	0.010	0.992	1.032000e+00	1.155	0.248	
sexM:IOTF_pOWcutoff_c100	-0.005	0.995	0.013	0.969	1.020000e+00	-0.420	0.675	

6.2 Conduct Problems

Often has temper tantrums or hot tempers

Generally obedient - Reverse Scored

Often fights with other children

Often lies or cheats

Steals from home, school or elsewhere

Table 21: Logistic Model: Conduct Problems (Elevated vs Not) - SES category + Maternal Education + Age + Sex + pOWcutoff

	b	e^b	se	e^2.5 CI	e^97.5 CI	z	p	
(Intercept)	-1.688	0.185	1.672	0.006	4.778	-1.010	0.313	
Month_AED25,000 - 55,000 AED	-0.352	0.703	0.526	0.249	1.989	-0.669	0.503	
Month_AED55,000 - 75,000 AED	0.324	1.383	0.988	0.190	10.184	0.328	0.743	
Month_AED> 75,000 AED	-0.387	0.679	0.933	0.099	4.124	-0.415	0.678	
Mother_ed	-0.005	0.995	0.074	0.857	1.152	-0.069	0.945	.
Age_yr	0.137	1.147	0.095	0.954	1.389	1.443	0.149	
sexM	-0.792	0.453	0.525	0.155	1.235	-1.510	0.131	
IOTF_pOWcutoff_c100	-0.007	0.993	0.010	0.974	1.012	-0.720	0.471	
sexM:IOTF_pOWcutoff_c100	0.011	1.011	0.012	0.987	1.036	0.875	0.382	

6.2.1 Hyperactivity

Restless, overactive

Constantly fidgeting or squirming

Easily distracted, concentration wanders

Thinks things out before acting - Reverse Scored

Sees tasks through to the end - Reverse Scored

Table 22: Logistic Model: Hyperactivity Problems (Elevated vs Not) - SES category + Maternal Education + Age + Sex + pOWcutoff

	b	e^b	se	e^2.5 CI	e^97.5 CI	z	p	
(Intercept)	0.989	2.689	2.182	0.037	2.194150e+02	0.453	0.650	
Month_AED25,000 - 55,000 AED	-0.817	0.442	0.670	0.115	1.660000e+00	-1.220	0.222	
Month_AED55,000 - 75,000 AED	-16.836	0.000	1584.870	NA	4.622569e+45	-0.011	0.992	
Month_AED> 75,000 AED	0.095	1.100	1.083	0.110	8.845000e+00	0.088	0.930	
Mother_ed	0.011	1.011	0.096	0.840	1.233000e+00	0.110	0.912	.
Age_yr	-0.155	0.856	0.126	0.659	1.089000e+00	-1.234	0.217	
sexM	-0.767	0.464	0.694	0.105	1.700000e+00	-1.106	0.269	
IOTF_pOWcutoff_c100	-0.002	0.998	0.012	0.973	1.022000e+00	-0.156	0.876	
sexM:IOTF_pOWcutoff_c100	0.008	1.008	0.017	0.973	1.042000e+00	0.453	0.651	

6.2.2 Peer Problems

Rather solitary, tends to play alone

Has at least one good friend - Reverse Scored

Generally liked by other children - Reverse Scored

Picked on or bullied

Gets on better with adults than with other children

Table 23: Logistic Model: Peer Problems (Elevated vs Not) - SES category + Maternal Education + Age + Sex + pOWcutoff

	b	e^b	se	e^2.5 CI	e^97.5 CI	z	p	
(Intercept)	0.048	1.049	1.806	0.030	38.161	0.026	0.979	
Month_AED25,000 - 55,000 AED	0.212	1.236	0.546	0.421	3.650	0.388	0.698	
Month_AED55,000 - 75,000 AED	2.186	8.896	1.294	0.931	215.972	1.689	0.091	.
Month_AED> 75,000 AED	0.176	1.193	0.938	0.184	7.743	0.188	0.851	
Mother_ed	-0.151	0.860	0.087	0.716	1.011	-1.726	0.084	.
Age_yr	0.152	1.164	0.101	0.959	1.431	1.497	0.134	
sexM	0.329	1.390	0.520	0.509	3.971	0.633	0.527	*
IOTF_pOWcutoff_c100	0.024	1.024	0.012	1.002	1.050	2.047	0.041	*
sexM:IOTF_pOWcutoff_c100	-0.030	0.970	0.014	0.942	0.997	-2.098	0.036	*

When examining odds of experiencing elevated peer problems, controlling for family income, mother education, child age, and child sex, percent of overweight, there was a significant sex x percent of overweight interaction.

```
sex = F:
 IOTF_pOWcutoff_c100 IOTF_pOWcutoff_c100.trend      SE  df asymp.LCL asymp.UCL
                  17                    0.02370 0.01158 Inf   0.00101    0.0464

sex = M:
 IOTF_pOWcutoff_c100 IOTF_pOWcutoff_c100.trend      SE  df asymp.LCL asymp.UCL
                  17                   -0.00632 0.00867 Inf  -0.02332    0.0107

Results are averaged over the levels of: Month_AED
Confidence level used: 0.95
```

For females, a female child with 110% of overweight cutoff would have 1.27 times the odds of experiencing elevate peer problems than a female child with 100% of overweight cutoff. There was no association between percent of overweight cutoff and odds of peer problems in males.

6.3 Prosocial

Considerate of other people's feelings

Shares readily with other children

Helpful if someone is hurt

Kind to younger children

Often volunteers to help others

Table 24: Logistic Model: Prosocial Problems (Low vs Not) - SES category + Maternal Education + Age + Sex + pOWcutoff

	b	e^b	se	e^2.5 CI	e^97.5 CI	z	p	
(Intercept)	-1.501	0.223	2.020	0.004	11.541	-0.743	0.457	
Month_AED25,000 - 55,000 AED	0.018	1.018	0.647	0.292	3.825	0.027	0.978	
Month_AED55,000 - 75,000 AED	-0.611	0.543	1.413	0.018	6.626	-0.433	0.665	
Month_AED> 75,000 AED	1.766	5.849	1.048	0.772	50.723	1.686	0.092	.
Mother_ed	-0.037	0.964	0.085	0.810	1.139	-0.435	0.664	
Age_yr	0.072	1.075	0.117	0.855	1.359	0.615	0.538	
sexM	-1.479	0.228	0.772	0.041	0.908	-1.916	0.055	*
IOTF_pOWcutoff_c100	-0.004	0.996	0.011	0.973	1.017	-0.384	0.701	
sexM:IOTF_pOWcutoff_c100	0.029	1.029	0.015	1.001	1.063	1.914	0.056	.

7 Extra Tables by Sex

7.1 Participant Characteristics

Table 25: Demographic Characteristics by Sex

Characteristic	N	F	M	t-test	chi/fisher
Age_yr	107	12.79 (2.84) [7.31 - 17.84]	12.70 (2.57) [8.04 - 17.54]	0.875	
BMI	107	24.85 (7.94) [12.71 - 47.60]	25.70 (10.34) [13.60 - 55.52]	0.646	
IOTF_pOWcutoff	107	112.22 (31.68) [67.29 - 193.18]	117.71 (43.37) [63.95 - 239.00]	0.471	
IOTF_WeightStatus	107				0.454
Thinness2		1 (1.6%)	2 (4.3%)		
Thinness1		5 (8.2%)	3 (6.5%)		
HW		18 (30%)	12 (26%)		
Overweight		14 (23%)	15 (33%)		
Obese		11 (18%)	3 (6.5%)		
MorbidlyObese		12 (20%)	11 (24%)		
Father_ed	102	13.08 (3.79) [0.00 - 18.00]	12.48 (3.14) [6.00 - 18.00]	0.384	
Unknown		3	2		
Mother_ed	99	13.14 (3.56) [3.00 - 18.00]	13.24 (3.04) [0.00 - 18.00]	0.884	
Unknown		4	4		
Month_AED	99				0.745
<25,000 AED		15 (27%)	16 (37%)		
25,000 - 55,000 AED		32 (57%)	21 (49%)		
55,000 - 75,000 AED		4 (7.1%)	2 (4.7%)		
> 75,000 AED		5 (8.9%)	4 (9.3%)		
Unknown		5	3		
DadNationality	101				1.00
Emirati		58 (97%)	40 (98%)		
Omani		1 (1.7%)	0 (0%)		
Yemeni		1 (1.7%)	1 (2.4%)		
Unknown		1	5		
MomNationality	104				0.526
Emirati		55 (92%)	41 (93%)		
Omani		1 (1.7%)	0 (0%)		
Yemeni		0 (0%)	1 (2.3%)		
Moroccan		2 (3.3%)	0 (0%)		
Egyptian		2 (3.3%)	1 (2.3%)		
Bahrani		0 (0%)	1 (2.3%)		
Unknown		1	2		

[1] Mean (SD) [Range]; n (%)

There were no differences by sex with the exception of females having a higher hip-to-waist ratio, which would be expected for this age range.

7.2 Medical Comorbidities

Table 26: Medical Comorbidities by Weight Status

Characteristic	N	F	M	t-test	chi/fisher
nComorbid	107	2.25 (1.07) [0.00 - 4.00]	2.02 (0.98) [0.00 - 4.00]	0.263	
VitDdeficiency	107				1.00
Y		56 (92%)	42 (91%)		
N		5 (8.2%)	4 (8.7%)		
Anemia	40				0.424
Iron Deficiency Anemia (ID)		13 (54%)	8 (50%)		
Thalassemia Minor (TM)		2 (8.3%)	1 (6.2%)		
G6PD Deficiency		0 (0%)	1 (6.2%)		
ID + TM		0 (0%)	2 (12%)		
ID + G6PD Deficiency		1 (4.2%)	0 (0%)		
Unspecified Anemia		8 (33%)	4 (25%)		
Unknown		37	30		
Hyperlipidemia	12				1.00
Hyperlipidemia		8 (89%)	3 (100%)		
Hyperlipidemia - Mixed		1 (11%)	0 (0%)		
Unknown		52	43		
ThyroidConditions	25				1.00
Abnormal Function		10 (56%)	4 (57%)		
Autoimmune Thyroiditis		3 (17%)	2 (29%)		
Autoimmune Hypothyroidism		0 (0%)	0 (0%)		
Unspecified Hypothyroidism		4 (22%)	1 (14%)		
Goiter		1 (5.6%)	0 (0%)		
Unknown		43	39		
GlycemicStatus	28				0.678
Impaired Fasting Glucose		9 (64%)	10 (71%)		
Impaired Glucose Tolerance Test		3 (21%)	4 (29%)		
Type-1 Diabetes		2 (14%)	0 (0%)		
Unknown		47	32		
Acanthosis Nigricans	8	6 (100%)	2 (100%)		
Unknown		55	44		
Hypertension	3				
Essential Primary Hypertension		1 (100%)	1 (50%)		
High Blood Pressure		0 (0%)	1 (50%)		
Unknown		60	44		
Metabolic Syndrome	2	1 (100%)	1 (100%)		
Unknown		60	45		
Growth.Stature	10				1.00
Failure To Thrive (FT)		0 (0%)	1 (17%)		
Growth Hormone Deficency		0 (0%)	1 (17%)		
Short Stature		3 (75%)	3 (50%)		
FT + ShortStature + Underweight		1 (25%)	0 (0%)		
Short Stature + Precocious Puberty		0 (0%)	1 (17%)		
Unknown		57	40		
PCOS	4				
PCOS		2 (50%)	0 (NA%)		
Hirsutism		1 (25%)	0 (NA%)		
Hirsutism + Unspecified Ovarian Cysts		1 (25%)	0 (NA%)		
Unknown		57	46		

[1] Mean (SD) [Range]; n (%)

Presence of different co-morbidities did not differ by sex, nor did the number of co-morbidities

7.3 Family History

Table 27: Family History by Sex

Characteristic	N	F	M	t-test	chi/fisher
Fam_OB_YN	101				0.895
yes		41 (71%)	29 (67%)		
no		17 (29%)	14 (33%)		
Unknown		3	3		
nFam_Obesity	107	1.80 (1.80) [0.00 - 7.00]	1.80 (1.71) [0.00 - 5.00]	1.00	
Mother	107	11 (18%)	7 (15%)		
Father	107	9 (15%)	12 (26%)		
Grandmother	107	19 (31%)	14 (30%)		
Grandfather	107	4 (6.6%)	2 (4.3%)		
Sister	107	10 (16%)	6 (13%)		
Brother	107	15 (25%)	10 (22%)		
Aunt	107	26 (43%)	19 (41%)		
Uncle	107	16 (26%)	13 (28%)		
Fam_ED_YN	96				0.517
yes		5 (8.9%)	6 (15%)		
no		51 (91%)	34 (85%)		
Unknown		5	6		
nFam_EatingDisorder	107	0.21 (0.97) [0.00 - 7.00]	0.22 (0.63) [0.00 - 3.00]	0.98	
Mother	107	1 (1.6%)	0 (0%)		
Father	107	1 (1.6%)	1 (2.2%)		
Grandmother	107	2 (3.3%)	2 (4.3%)		
Grandfather	107	2 (3.3%)	0 (0%)		
Sister	107	2 (3.3%)	0 (0%)		
Brother	107	1 (1.6%)	1 (2.2%)		
Aunt	107	3 (4.9%)	4 (8.7%)		
Uncle	107	1 (1.6%)	2 (4.3%)		

[1] n (%); Mean (SD) [Range]

There were no differences by sex.

7.4 Sleep

Table 28: Sleep by Sex

Characteristic	N	F	M	t-test	chi/fisher
Bedtime_cat	97				0.151
7 - 8 pm		12 (21%)	8 (20%)		
9 pm		9 (16%)	14 (34%)		
10 pm		15 (27%)	9 (22%)		
11 - Midnight		14 (25%)	4 (9.8%)		
After Midnight		6 (11%)	6 (15%)		
Unknown		5	5		
Bed_hr	99	8.55 (1.54) [6.00 - 12.00]	8.35 (1.80) [2.00 - 11.50]	0.548	
Unknown		4	4		
CSHQ_BedtimeResit	94	7.72 (2.10) [5.00 - 13.00]	6.85 (2.17) [5.00 - 13.00]	0.056	
Unknown		8	5		
CSHQ_SleepOnsetDelay	100	1.69 (0.86) [1.00 - 3.00]	1.81 (0.83) [1.00 - 3.00]	0.486	
Unknown		3	4		
CSHQ_SleepDuration	99	4.86 (1.62) [3.00 - 9.00]	4.40 (1.80) [3.00 - 9.00]	0.198	
Unknown		4	4		
CSHQ_SleepAnxiety	98	6.02 (2.58) [4.00 - 12.00]	5.24 (2.05) [4.00 - 11.00]	0.099	
Unknown		5	4		
CSHQ_NightWaking_no16	96	3.11 (1.36) [2.00 - 6.00]	2.68 (1.11) [2.00 - 6.00]	0.094	
Unknown		6	5		
CSHQ_Parasomnias	93	8.75 (2.26) [7.00 - 19.00]	8.97 (2.26) [7.00 - 19.00]	0.634	
Unknown		6	8		
CSHQ_SleepDisorderBreathing	95	2.87 (1.24) [2.00 - 7.00]	2.98 (1.44) [2.00 - 7.00]	0.710	
Unknown		7	5		
CSHQ_DaytimeSleepiness	91	12.64 (3.35) [6.00 - 18.00]	12.39 (3.74) [6.00 - 22.00]	0.747	
Unknown		8	8		
CSHQ_Total_no16	72	46.51 (7.52) [34.00 - 63.00]	44.73 (8.74) [32.00 - 71.00]	0.361	
Unknown		22	13		

[1] n (%); Mean (SD) [Range]

There were no differences by sex.

7.5 Strengths and Difficulties Questionnaire

Table 29: Strengths and Difficulty by Sex

Characteristic	N	F	M	t-test	chi/fisher
SDQ_EmotionProb_raw	104	3.54 (2.17) [0.00 - 9.00]	2.69 (2.22) [0.00 - 8.00]	0.053	
Unknown		2	1		
SDQ_ConductProb_raw	102	2.00 (1.66) [0.00 - 6.00]	1.98 (1.71) [0.00 - 7.00]	0.945	
Unknown		2	3		
SDQ_HyperactiveProb_raw	103	3.12 (2.31) [0.00 - 10.00]	3.85 (2.37) [0.00 - 10.00]	0.120	
Unknown		2	2		
SDQ_PeerProb_raw	102	2.85 (1.42) [0.00 - 5.00]	3.30 (1.49) [0.00 - 7.00]	0.124	
Unknown		2	3		
SDQ_Prosocial_raw	102	8.38 (1.46) [4.00 - 10.00]	8.53 (1.93) [2.00 - 10.00]	0.659	
Unknown		3	2		
SDQ_TotalProb_raw	106	11.13 (5.05) [0.00 - 23.00]	11.50 (5.65) [3.00 - 29.00]	0.729	
Unknown		0	1		
SDQ_TotalProb_cat	93				0.411
CloseToAverage		37 (71%)	26 (63%)		
High		8 (15%)	4 (9.8%)		
SlightlyRaised		5 (9.6%)	7 (17%)		
VeryHigh		2 (3.8%)	4 (9.8%)		
Unknown		9	5		
SDQ_EmotionProb_cat	104				0.347
CloseToAverage		31 (53%)	31 (69%)		
High		13 (22%)	6 (13%)		
SlightlyRaised		10 (17%)	4 (8.9%)		
VeryHigh		5 (8.5%)	4 (8.9%)		
Unknown		2	1		
SDQ_ConductProb_cat	102				0.98
CloseToAverage		40 (68%)	29 (67%)		
High		11 (19%)	7 (16%)		
SlightlyRaised		7 (12%)	6 (14%)		
VeryHigh		1 (1.7%)	1 (2.3%)		
Unknown		2	3		
SDQ_HyperactivityProb_cat	103				0.704
CloseToAverage		48 (81%)	37 (84%)		
High		0 (0%)	1 (2.3%)		
SlightlyRaised		8 (14%)	4 (9.1%)		
VeryHigh		3 (5.1%)	2 (4.5%)		
Unknown		2	2		
SDQ_PeerProb_cat	102				0.312
CloseToAverage		23 (39%)	17 (40%)		
High		19 (32%)	11 (26%)		
SlightlyRaised		13 (22%)	7 (16%)		
VeryHigh		4 (6.8%)	8 (19%)		
Unknown		2	3		
SDQ_Prosocial_cat	102				0.482
CloseToAverage		42 (72%)	35 (80%)		
Low		3 (5.2%)	2 (4.5%)		
SlightlyLowered		11 (19%)	4 (9.1%)		
VeryLow		2 (3.4%)	3 (6.8%)		
Unknown		3	2		

[1] Mean (SD) [Range]; n (%)

There were no differences by sex.

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\end{document}
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