Introduction
Adolescence is characterized by accelerated growth rate and increased caloric needs, and considered to be a nutritionally vulnerable time where dietary excess and insufficiency, and lack of variety and balance (unhealthy diet) are common. These are often confounded by lifestyle changes that contribute to the erratic and unhealthy eating behaviors which lead to increased rate of obesity during adolescence (Banna J.C et. al, 2016). The contribution of genetic factors (i.e. polymorphisms in the FTO gene variants (rs9939609, rs17817449) and MC4R rs17782313) to obesity can not be discounted.

Over 340 million children and adolescents aged 5-19 y.o were overweight or obese and has nearly tripled since 1975 (WHO, 2016). Overweight and obesity is no longer a high-income country problem but also a great concern for the low- and middle-income countries, particularly in urban settings. Most of the world's population live in countries where overweight and obesity kills more people than underweight. In the Philippines, the number of overweight/obesity is on the rise and has reached 8.3% (2013 Facts and Figures).

Thus, it is imperative to determine the contributory factors that predisposes an adolescent to obesity.

Methods
Inclusion criteria:
✓ without any sickness /abnormality during the conduct of the study;
✓ without chronic disease (diabetes, hypothyroidism, bronchopneumonia);
✓ psychologically fit;
✓ no eating disorder –anorexia, bulimia;
✓ age range: 13 – 18 years old.

01 Anthropometric Measurements
- Measurement of Weight, Height, Body Fat, Waist and Hip Circumference

02 Accomplishment of Questionnaires
- Collection of Data using Three Factor Eating Questionnaire and 5-day Food Diary

03 Analysis of Genes
- Genotyping for FTO rs9939609 & 1421085 & MC4R rs17782313

04 Data Analysis
- t-test, ANOVA, Simple and Multiple Logistic Regression
- Significance set at p<0.10
- Stata 12 for Windows

What Makes Teenagers Fat?
Obesity-Associated Factors in Selected Filipino Adolescents
Mildred A. Udarbe1, Edward Vincent J. Magtibay1, Jacus S. Nacis1, Maria Julia G. Gubat1, Rod Erick L. Agarrado1, Dana Sophia M. Alonzo1, Angelique Q. Tongco1, Ma. Cristina P. Tañada1, Maylin C. Palatino2
1Lifestage Nutrition Section/Nutrition Research and Development Group, 2University of the Philippines-Manila
Results

Table 1. Anthropometric Characteristics of selected adolescents (n=280) in Taguig and Pateros

<table>
<thead>
<tr>
<th>Anthropometric Characteristic</th>
<th>Mean ± s.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight, kg</td>
<td>50.8 ± 10.8</td>
</tr>
<tr>
<td>Height, cm</td>
<td>157.1 ± 7.2</td>
</tr>
<tr>
<td>Body Fat, %</td>
<td>17.8 ± 7.2</td>
</tr>
<tr>
<td>Waist-hip ratio</td>
<td>0.8 ± 0.1</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>20.5 ± 3.8</td>
</tr>
</tbody>
</table>

Fig 1. Percent Distribution of participants by BMI category and sex

Overall, seven out of every ten participants were found to have normal BMI while 1 out of 10 were either overweight or obese. This was almost the same if we segregate data by sex.

Fig 2. Percent Distribution of participants by A) FTO rs9939609 genotype B) FTO rs1421085 genotype C) MC4R rs1778213 genotype

Majority of the participants are non-risk carriers of FTO rs9939609 (65.4%), FTO rs1421085 (96.1%), and MC4R rs1778213 (16.8%)

Fig 3. Mean Eating Behavior Scores of participants by BMI category

The overweight/obese adolescents recorded significantly lower scores for restraining food intake as compared to the normal weights and underweights.
Results

Fig 5. Mean Macronutrient Intake (g) of participants based on risk carriers of obesity-associated genes

Except for fat intake, only the risk-carriers of the obesity-gene FTO rs1421085 indicated significantly higher carbohydrate and protein intakes as compared to non-risk and risk carriers of FTO rs9939609 and MC4R rs1778213.

Table 2. List of Significant Factors Associated with BMI

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adjusted Odds Ratio (90% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waist-Hip Ratio</td>
<td>$1.61 \times 10^{12}$ (6.69 x 10^{08}, 3.89 x 10^{15})</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>FTO rs1421085 risk-carrier (C)</td>
<td>10.3 (2.06, 51.92)</td>
<td>0.017</td>
</tr>
<tr>
<td>Carbohydrate intake</td>
<td>0.99 (0.99, 0.99)</td>
<td>0.052</td>
</tr>
</tbody>
</table>

- Higher waist-hip ratio was found to be associated with being overweight/obese.
- Risk carriers of FTO rs1421084 had ten times greater chances of becoming overweight or obese than their non-risk carrier counterpart.
- A gram increase in carbohydrate intake increases the chance of one becoming overweight or obese.

Conclusions and Recommendations

- The Filipino-translated TFEQ can be useful in characterizing eating behaviors of the adolescents having different weight categories.
- Eating behavior, particularly limiting or monitoring food intake (cognitive restraint), plays a role in the development of overweight/obesity as indicated in their significantly lower scores among the different weight categories.
- Waist hip ratio, risk-carriers (C) of FTO rs1421085, and carbohydrate intake contributes to body weight.
- Different culture have different responses related to obesity-associated genes and different phenotypes thus, additional studies and genetic screening in adolescents at a larger scale are still needed to fully understand how these factors can influence and contribute to lifestyle modification to decrease the prevalence of obesity in the adolescents.

Acknowledgment

Dr. Caroline Anne Castro – Project Pediatrician
Dr. Cely Magpantay – Clinical Psychologist
Ms. Princess Ann G. Española – Project Aide