



Identifying the “tipping” age for overweight pediatric patients at Virginia Beach Tidewater Children’s Associates

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Background

- NHANES 2005-2006: 16% of U.S. children are overweight and greater than 32% are at risk of overweight⁶
 - overweight = 95% percentile or greater
 - at risk of overweight = 85% – 94%
- Overweight children has much higher health risks¹
- Overweight children = overweight adults⁴
- Only 1/5 – 1/3 of overweight children are diagnosed²
- Inadequate overweight management³

Methods

- Patients from VA Beach TCA with diagnoses of overweight (278.0-278.02) or excessive weight gain (783.1)
- Inclusion criteria: 2-21 years old, BMI or weight/length ratio $\geq 85\%$, at least 5 weight and height measurements
- Exclusion criteria: chronic diseases that may impair BMI ratio (Turners, Prader Willi, chronic steroid use, etc.)
- Children⁷ ≥ 2 years old: BMI = kg/m^2
 < 2 years old: weight/length ratio



Patient Demographics

- 260 charts reviewed, 111 patients met criteria
- Age: average = 144 months, standard deviation (sd) = 44 months
- Gender: 57.7% male
- Ethnicity: 46% Caucasian, 28.8% African-American, 16.2% unknown
- Health insurance: 62% private insurance, 28% Medicaid, 9% TriCare

Patient Health Information

- Total # of visits with weight/height data: average = 12, sd = 4.7
- Birth weight: average = 3.5 kg, sd = 0.5 kg
- Among 75 patients with gestation age information, 95% were full-term and 5% were pre-term
- Among 65 patients in the cohort, 28.6% were breast-fed
- Asthma, reactive airway disease, ADD, ADHD are the most common chronic co-morbidities

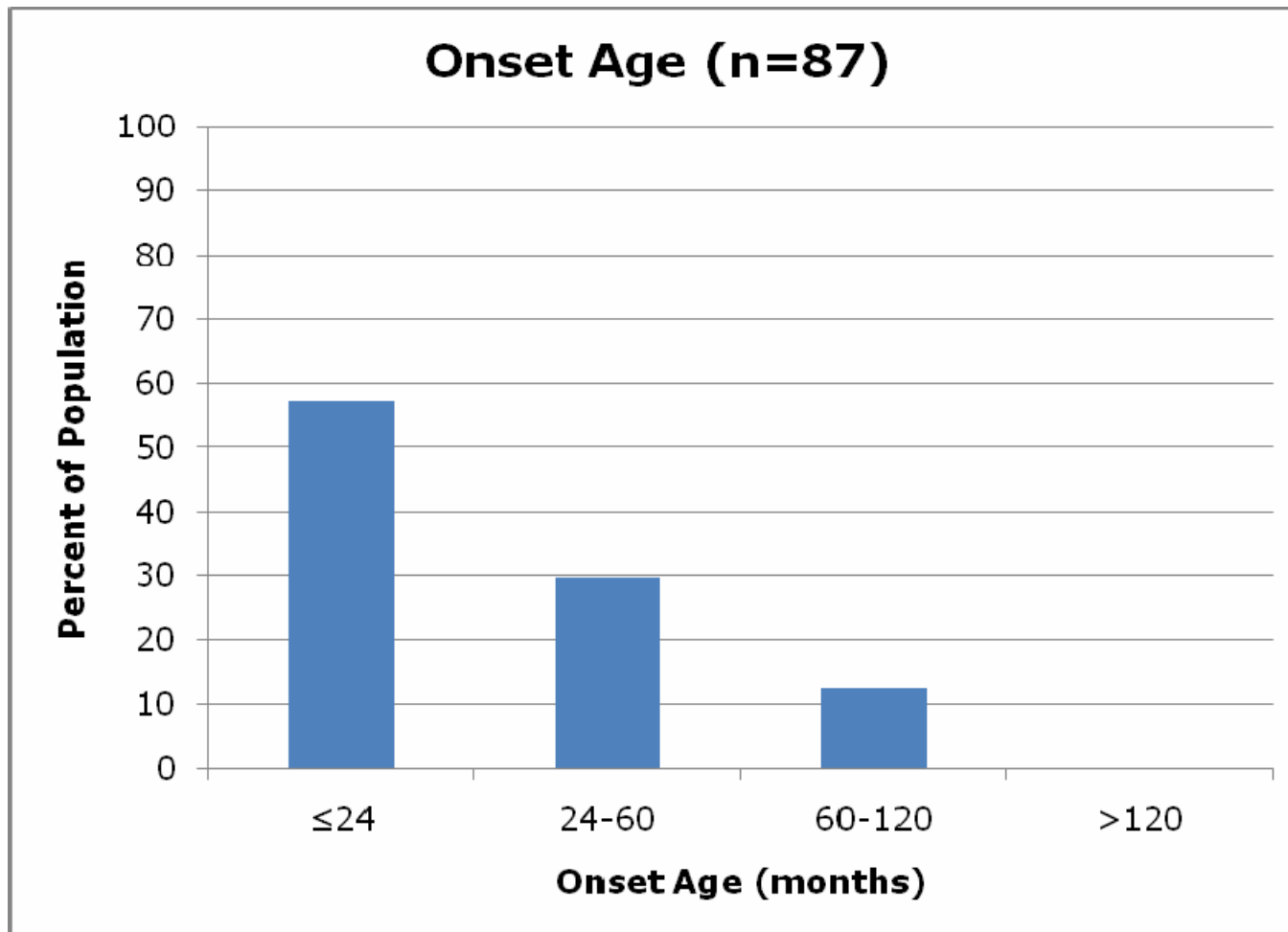


Onset Age versus Tipping Age

Onset Age: actual age of visit when the patient becomes and remains at risk of overweight or overweight based on their BMI and/or weight/length ratio data. Remaining at risk of overweight or overweight means that 50% of the weight & height data following the initial onset is at or above 85%.

Tipping Age: age when the patient becomes and remains at risk of overweight or overweight based on regression modeling determined from the plot of the patient's BMI data.

Onset Age Group





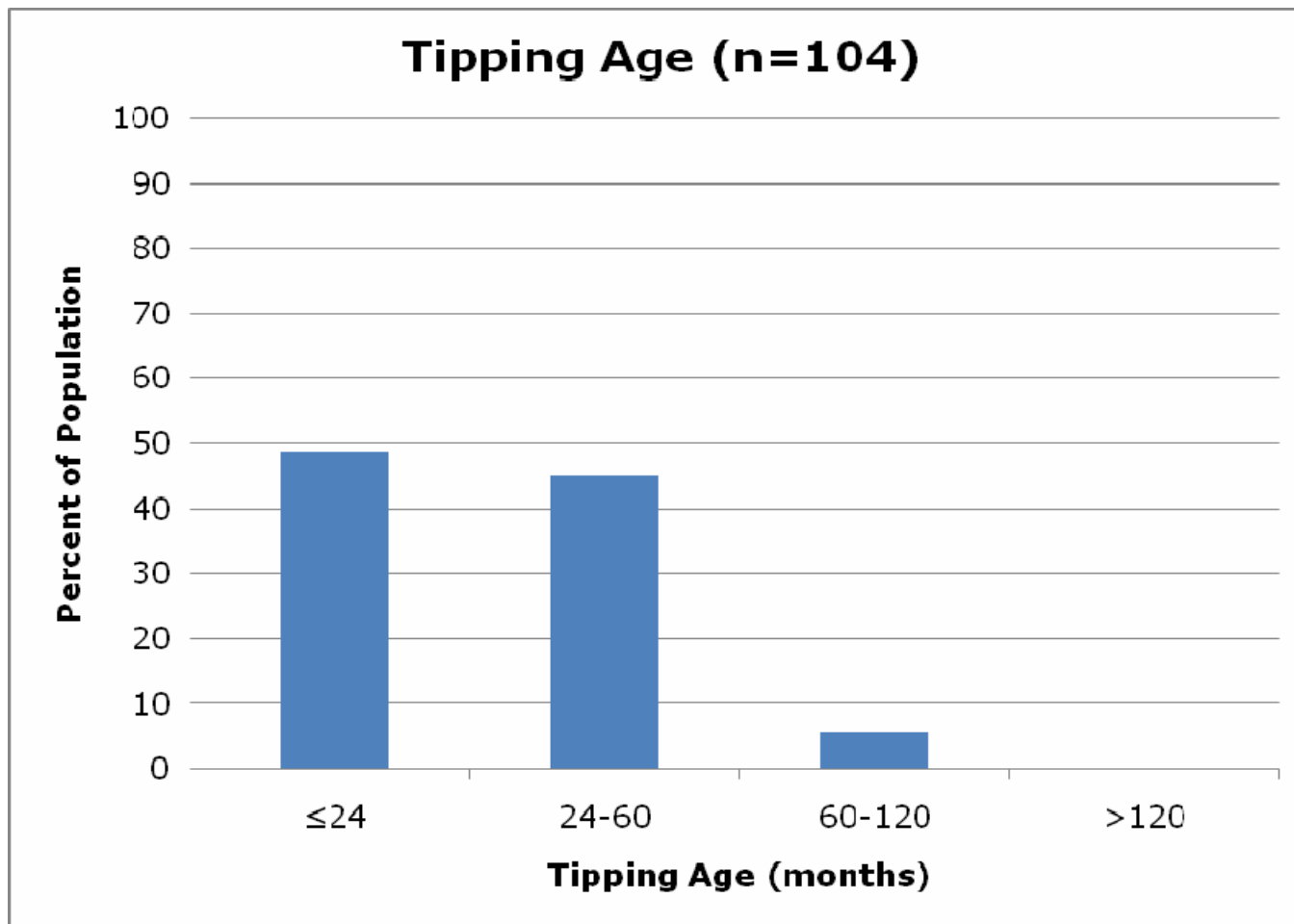
Onset Age (n=87)

- Among the 24 patients with missing onset age, 6 patients did not remain at risk of overweight or overweight while the remaining patients were already overweight to begin with.
- Over half of the patients became at risk of overweight or overweight at or before 2 years old; nearly 90% of the patients at or before 5 years old.
- Despite the mean age of 12 years old, no patients became overweight at or later than 10 years old.

Onset Age

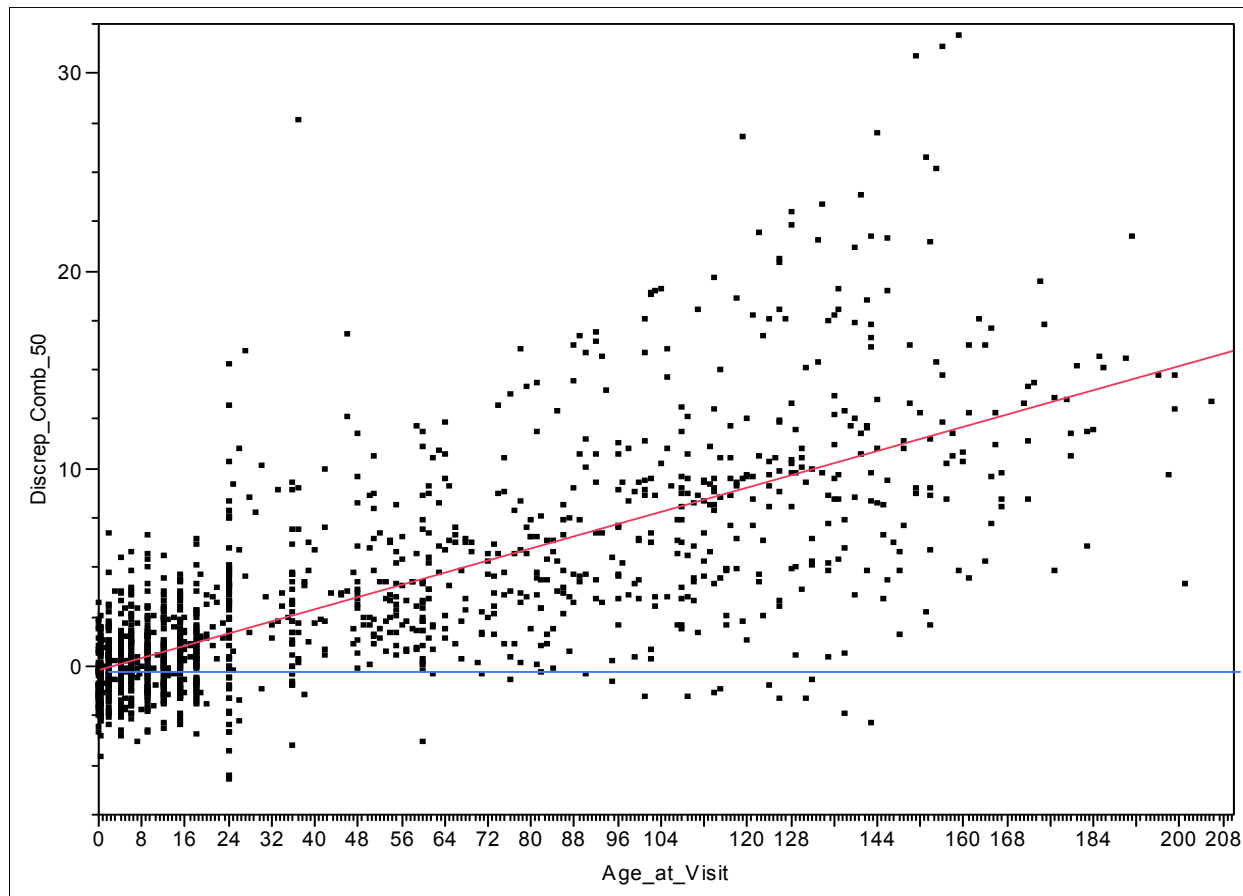
Onset Age (years)	Percent of Population
0 - 1	29.63
1 - 2	24.69
2 - 3	8.64
3 - 4	8.64
4 - 5	14.81
5 - 6	7.41
6 - 7	1.23
7 - 8	2.47
8 - 9	1.23
9 - 10	1.23
> 10	0.00

Tipping Age Group



Similar results as Onset Age

BMI discrepancy plot with 50% baseline



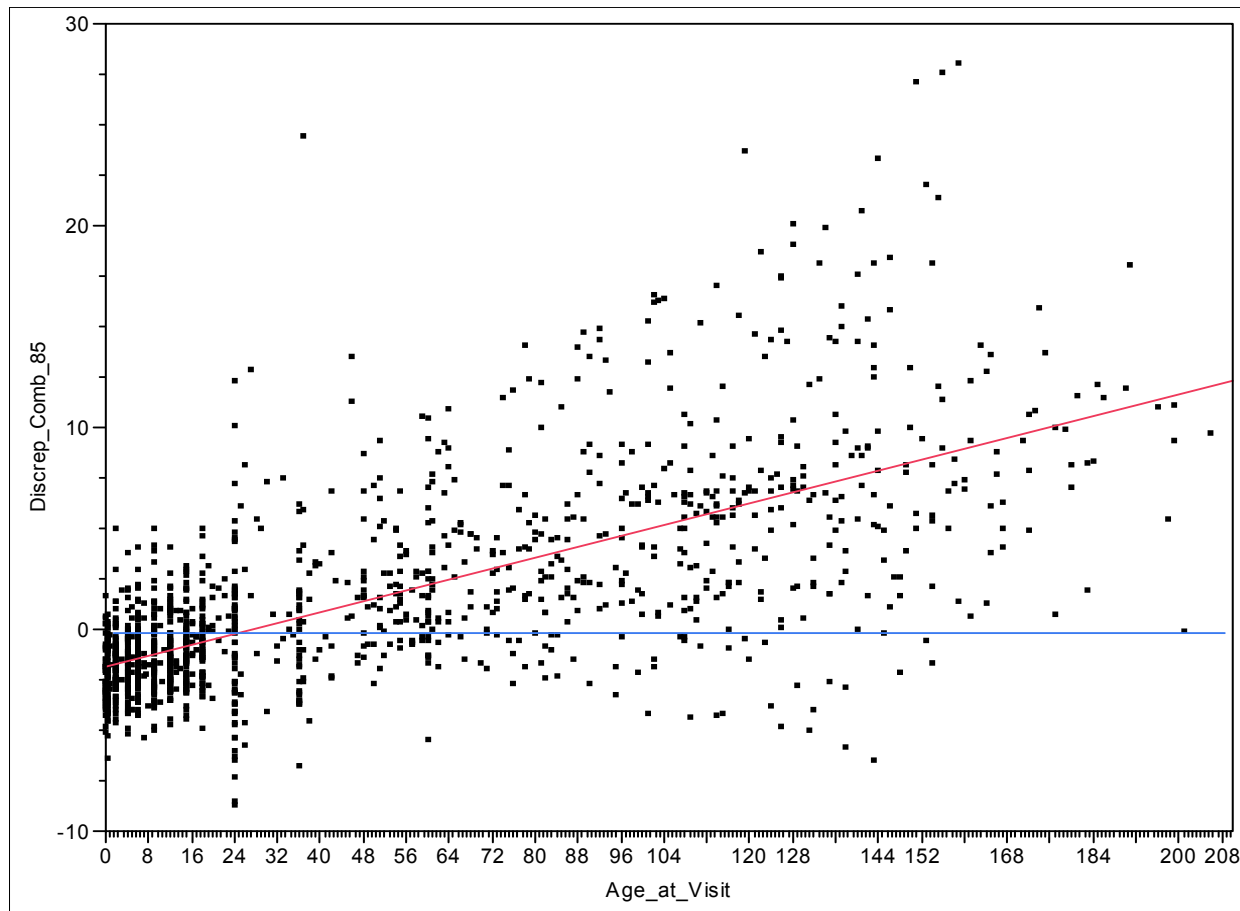
R-square = 0.53

Slope = 0.08 or
gain of 0.08 BMI
discrepancy unit
per month

X-int = 3

Overweight children begin gaining weight at a rate of 0.08 excess BMI unit/month from 3 months old.

BMI discrepancy plot with 85% baseline



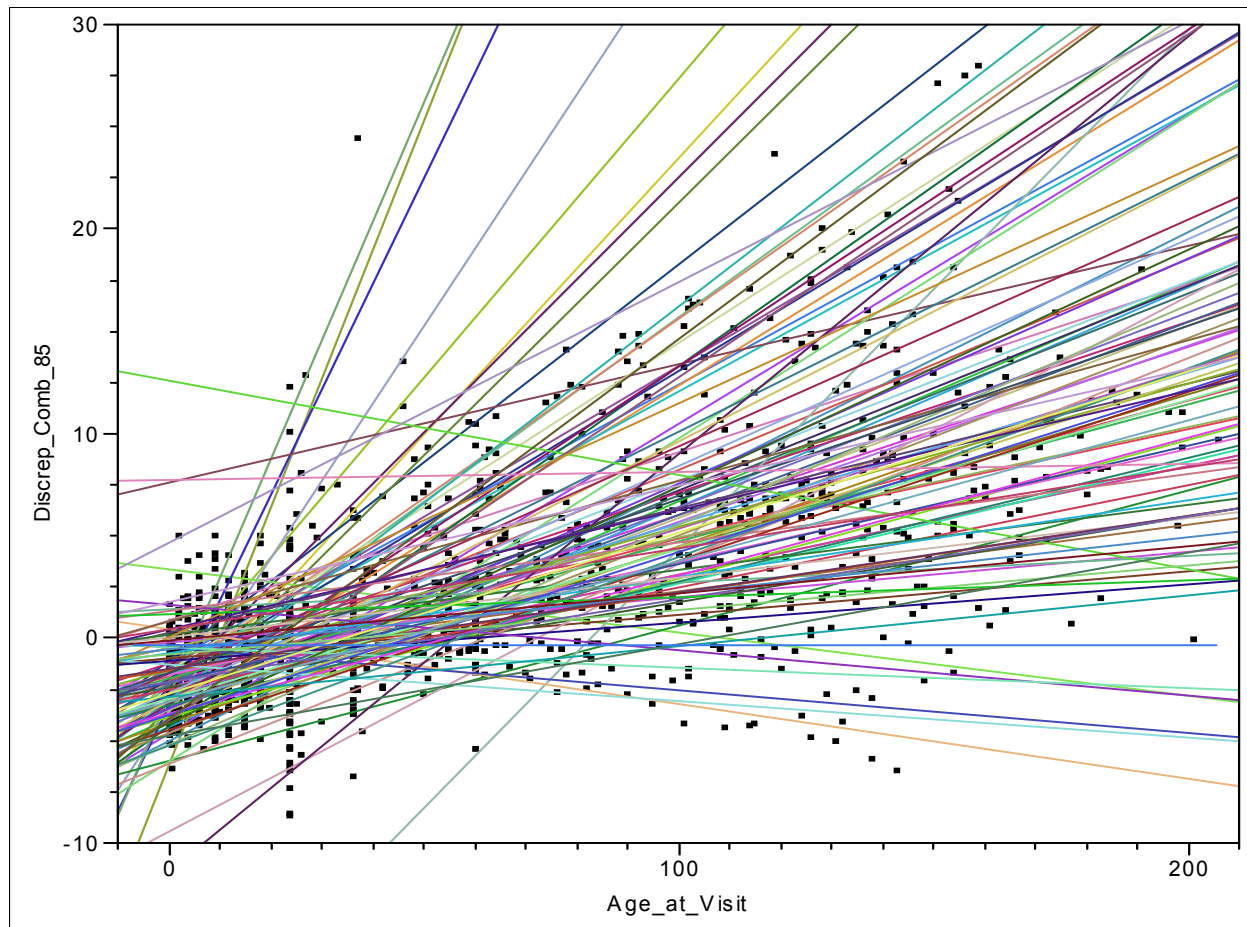
R-square = 0.46

Slope = 0.07 or
gain of 0.07 BMI
discrepancy unit
per month

X-int = 27.8

Overall plot of every BMI data reveals that overweight children become at risk of overweight at 28 months old.

Multilevel Regression Model with 85% baseline



Slope = 0.07

X-int = 23.5

S.E. = 4

Averaging multilevel regression model of tipping age reveals that overweight children become at risk of overweight at 24 months.

Conclusions

- Pediatric patients at TCA become at risk of overweight at a very young age; the critical age is around 2 years old.
 - Data from the patient population at CHKD shows similar results despite differential demographics.
- Overweight children experience excessive weight gain starting from birth at a rate of 1 excess BMI unit per year.
- Recommendation: Pediatricians should advocate healthy eating behavior and physical activities to children as early as the infancy stage, definitely by toddlerhood.

References

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- 4) Guo SS, Wu W, Chumlea WC, Roche AF. Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence. *Am J Clin Nutr* 2002; 76: 653-658.
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- 6) Ogden CL, Carroll MD, Flegal KM. High Body Mass Index for Age Among US Children and Adolescents, 2003-2006. *JAMA* 2008; 299(20):2401-2405.
- 7) Speiser PW, Rudolf MCJ, Anhalt H, Camacho-Hubner C, et al. Childhood Obesity Consensus Statement. *J of Clin Endo Metab.* 2004; 90:1871-1887.



Thank You!

Special thanks to:

- Dr. Pasquinelli and Dr. Harrington for their guidance
- Dr. Paulson for his assistance with the data analyses
- The staff at VA Beach TCA who was very supportive with my chart review
- Pediatrics Department at CHKD for making this research possible