The 5As of Pediatric Obesity Management

CHEO's Centre for Healthy Active Living

There is no wrong way to have a body

All bodies are unique and essential. All bodies are whole. All bodies have strengths and needs that must be met. We are powerful not despite the complexities of our bodies but because of them. We move together, with no body left behind.

Aurora Levins Morales and Patty Berne

Disability and health activists

Moving together with our differences, that's when we can really make important change

Living with Obesity

- Your body is ALWAYS worthy of care
- Your body is ALWAYS worthy of intervention when it is in trouble
- Your body is NOT taking up too much space

- Nikki Masse (Living with Obesity)

Objectives

- Introduce the 5As of Pediatric Obesity Management
- Review the 4Ms Framework for the assessment of obesity related complications , root causes of obesity, drivers of weight gain and barriers to weight management
- Apply the Edmonton Obesity Staging System for Pediatrics to better determine health risk and health care needs in pediatric obesity assessment and management

Disclosures

- Faculty: Stasia Hadjiyannakis

- Relationships with commercial interests:
  - NovoNordisk, Honorarium for invited lecture
  - Rhythm Pharmaceuticals: Advisory Board

- This program has received financial support from the Ministry of Health


ASK
ASSIST
5As
of Pediatric Obesity Management
Canadian Obesity Network
ASSESS
AGREE
ADVISE
Canadian Obesity Network • Réseau Canadien en Obésité
CHEO
CENTRE FOR HEALTHY ACTIVE LIVING

Key Principles

Key Principles

Obesity Management is About Improving Health and Well-being, and not Simply Reducing Numbers on the Scale

Key Principles

Weight bias can be a barrier to weight management

Key Principles

Interventions should include addressing 'root causes' of obesity and removing roadblocks for families to make healthy changes

Key Principles

A Child's 'Best' BMI May Never Be His or Her 'Ideal' BMI

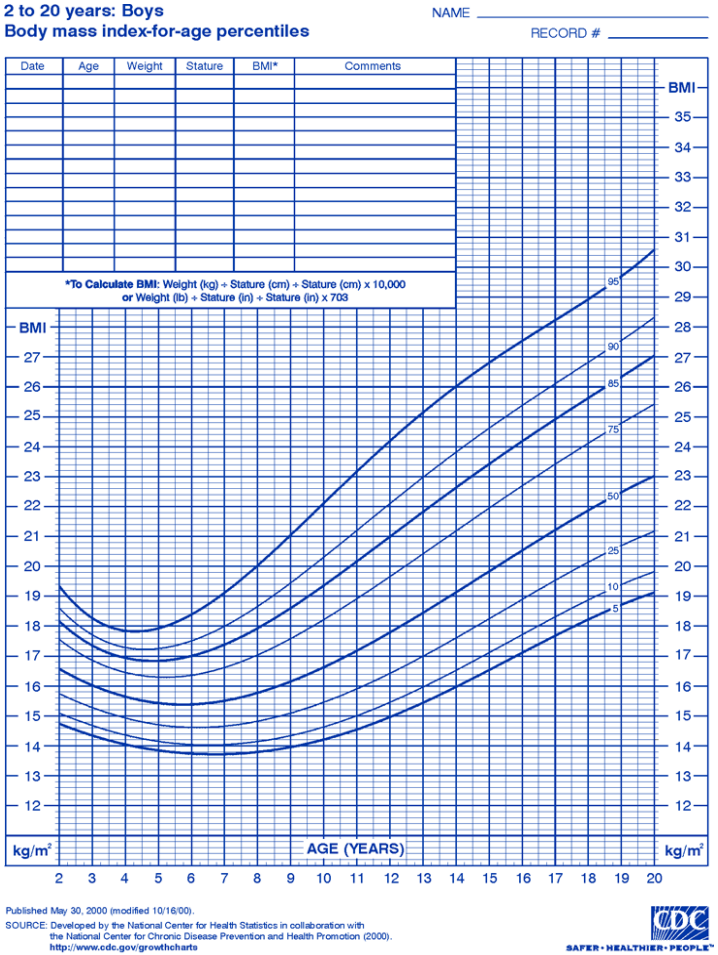
Key Principles

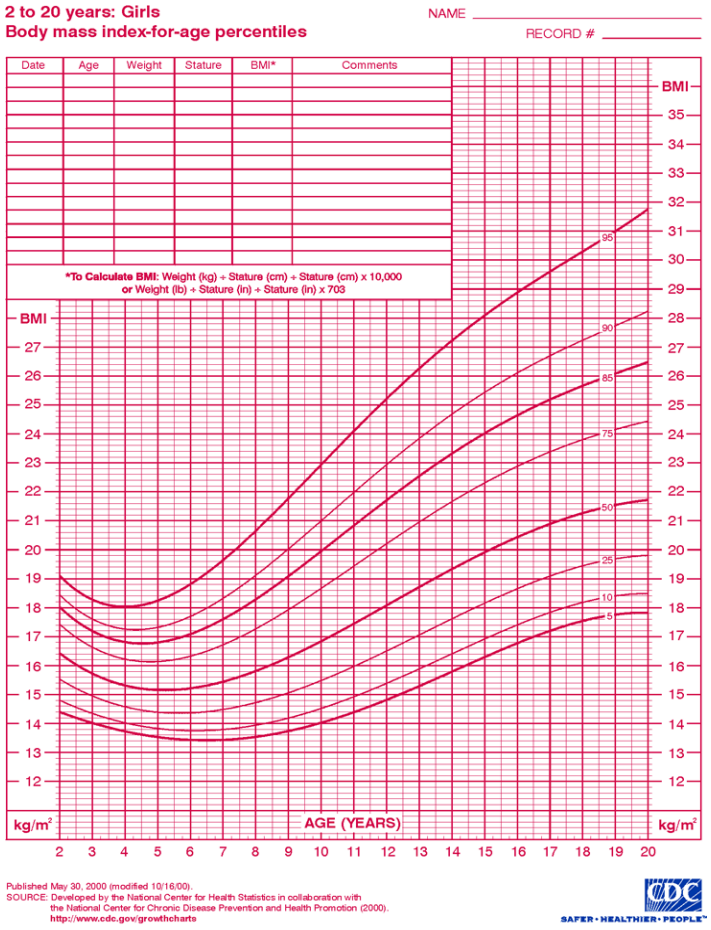
Success is different for every child and family

WHO Definition:

Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. ***A crude population measure of obesity is the body mass index (BMI)***

Obesity is Defined as BMI > 95th%



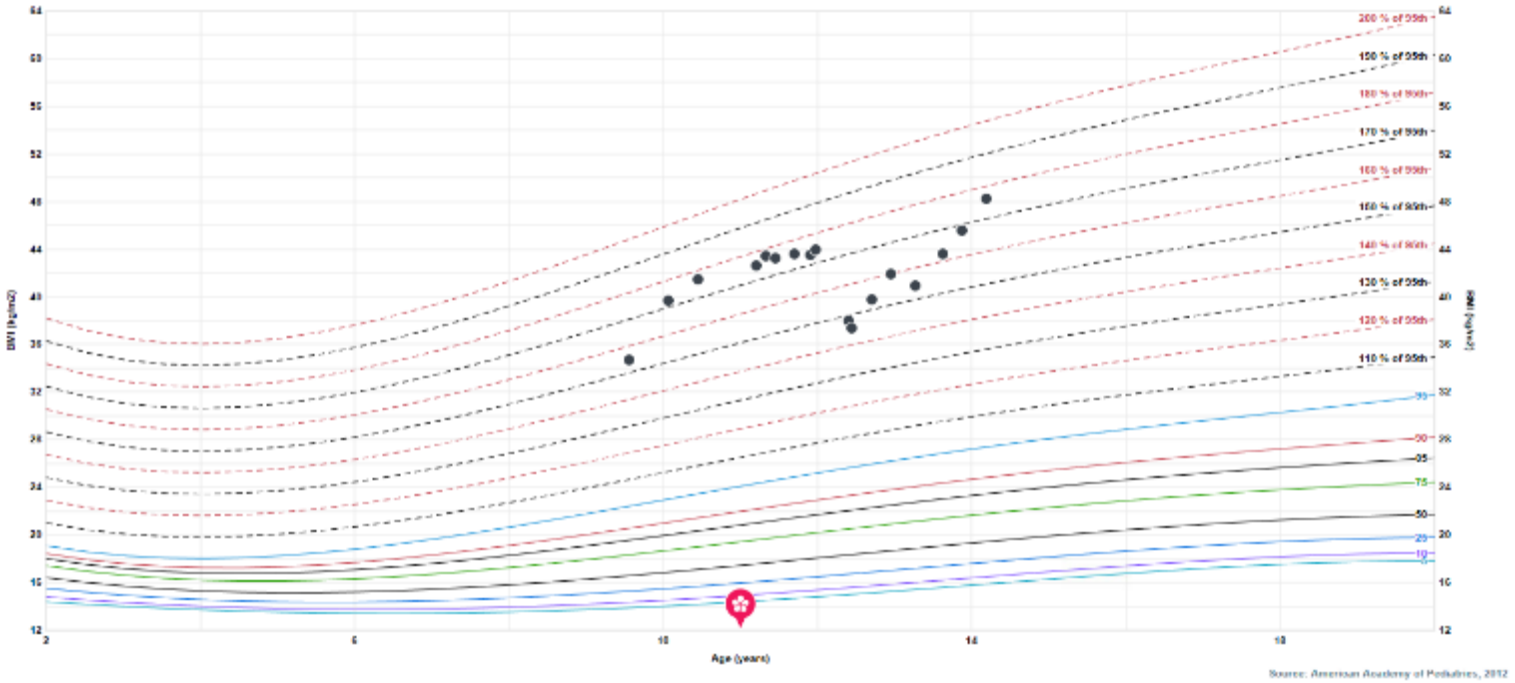


Obesity Class

Classification	CDC	WHO
Class I	95th to 120% of 95th%	Z- Score +2 to 3
Class II*	120 to 140% of 95th%	Z- Score +3 to 4
Class III*	Greater than 140% of 95th%	Z-Score greater than 4

*severe obesity

Expanded BMI Curve



Limitations of BMI Classification Systems

Jeff

12 y/o, BMI 32 kg/m^2

Excels in school, has many friends. Active with hockey and soccer. Has supportive parents. Has no biochemical or clinical evidence of weight related health complications.

Aaron

12 y/o, BMI 32 kg/m^2

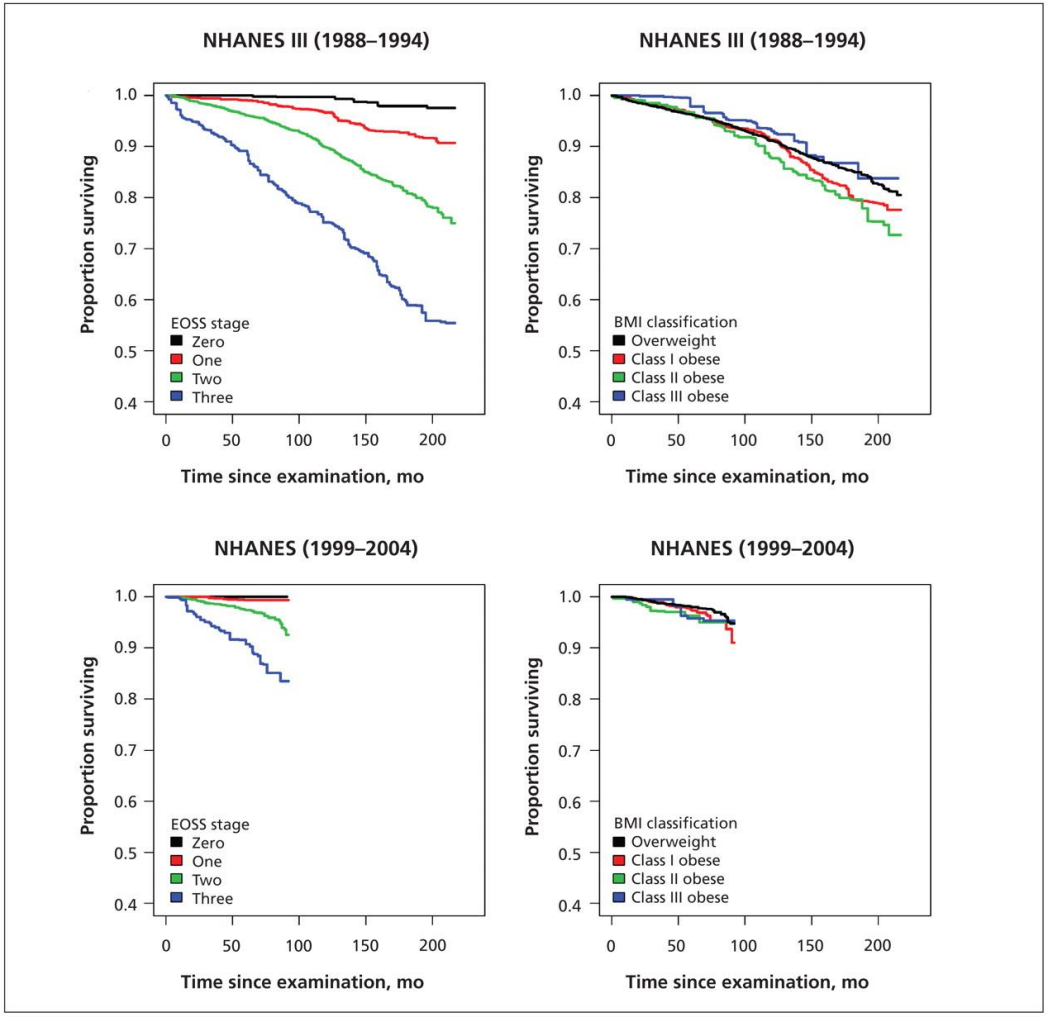
Has ADHD and a non-verbal learning disability. Is being bullied at school and has few friends. He has type 2 diabetes. Lives in unsafe neighbourhood with limited opportunities for play.

Edmonton Obesity Staging System

- Risk-stratification system that classifies adults with obesity into 5 graded categories based on morbidity and health-risk profiles

- EOSS independently predicted increased mortality even after adjustment for common methods of classifying obesity

EOSS BMI Class



Survival Curves diverge when stratified by EOSS score but not BMI Class

Padwal R S et al. CMAJ (2011)

EOSS-P: **E**dmonton **O**besity **S**taging **S**ystem – **P**ediatrics *Staging Tool*

Stage 0

- ***Metabolic***: No metabolic abnormalities
- ***Mechanical:*** No functional limitations
- ***Mental:*** No psychopathology
- ***Milieu:*** No parental, familial or social environment concerns

Stage 1

- ***Metabolic***: Sub-clinical risk factors (Acanthosis Nigricans, pre- hypertension, IFG/IGT, mild lipid abnormalities, mild elevation in transaminases, mild to moderate fatty infiltration of liver)
- ***Mechanical:*** Mild OSA not requiring PAP therapy, mild MSK pain and/or dyspnea not interfering with ADL
- ***Mental:*** Mild psychopathology, ADHD, LD, mild body image pre-occupation, occasional emotional/binge eating, bullying, mild developmental delay
- ***Milieu:*** Minor problems in relationships, minor limitations in caregivers ability to support child's needs

Stage 2

- ***Metabolic***: Type 2 Diabetes, Hypertension, moderate lipid abnormalities, moderate elevation of transaminases and/or severe fatty infiltration of liver, PCOS, asymptomatic gall stones
- ***Mechanical:*** OSA requiring PAP therapy, GERD, MSK pain limiting activity, moderate limitations in ADLs
- ***Mental:*** Major depression, anxiety, school absenteeism, frequent binging, significant bullying (school or home), significant body image disturbance, moderate developmental delay
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Stage 3

- ***Metabolic***: Uncontrolled T2DM (+/- complications), hypertension, FSGS, markedly elevated liver enzymes and/or liver dysfunction, symptomatic gall stones, marked lipid abnormalities
- ***Mechanical:*** OSA requiring PAP therapy and suppl. oxygen, limited mobility, shortness of breath sitting/sleeping
- ***Mental:*** Uncontrolled psychopathology, school refusal, daily binge eating, severe body image disturbance
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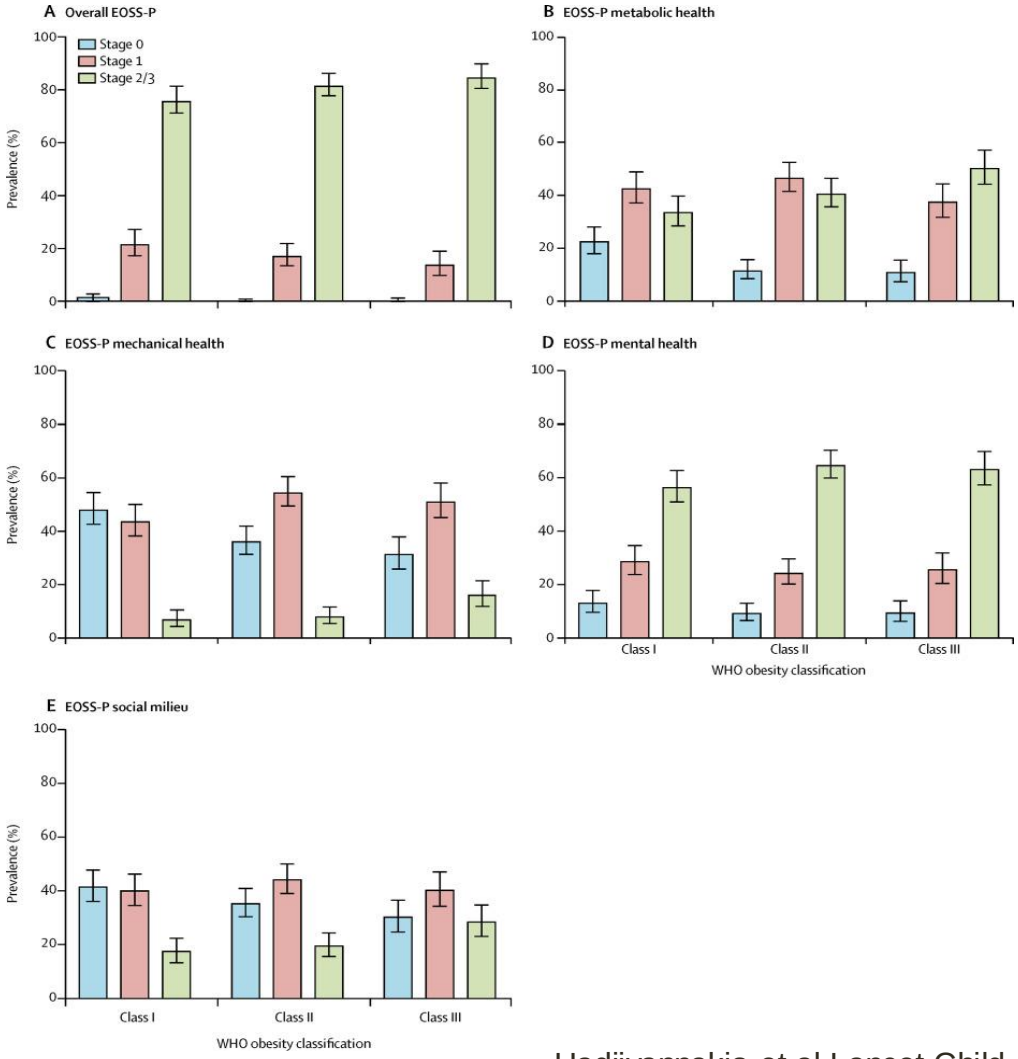
EOSS-P

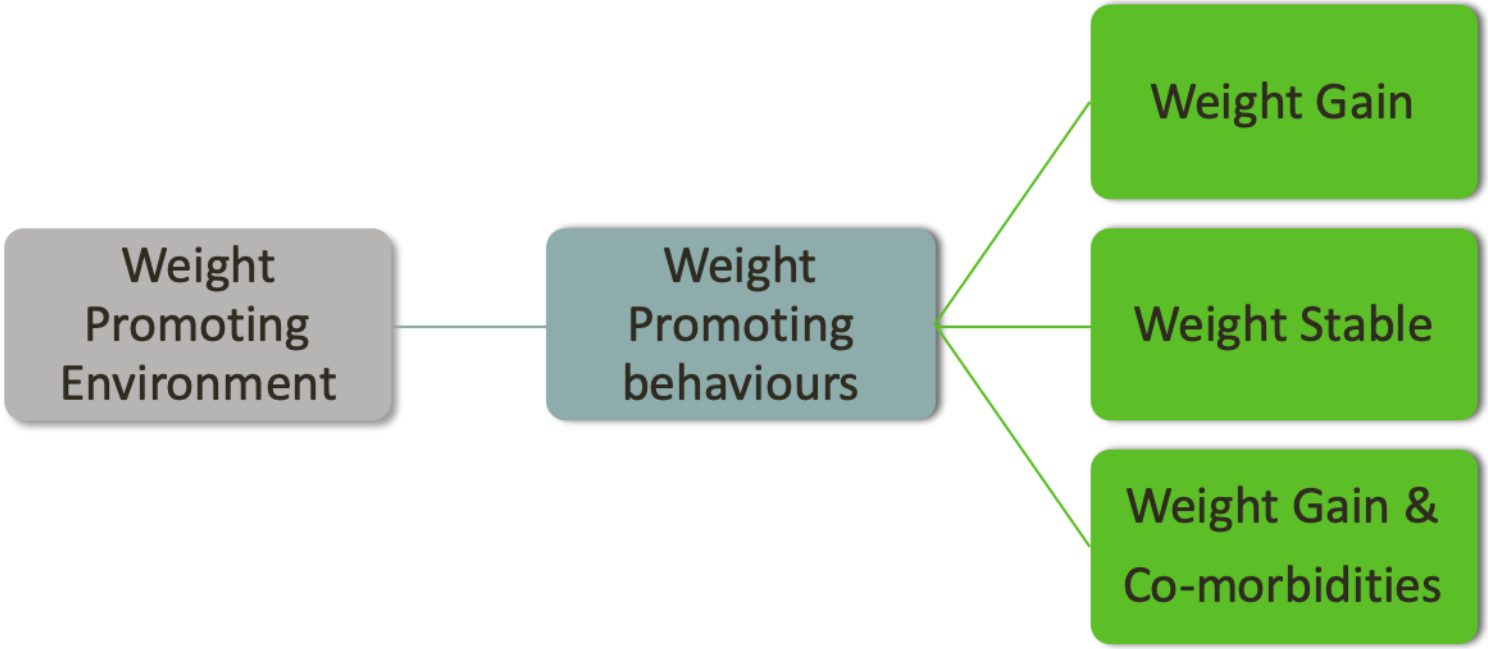


Hadjiyannakis et al Lancet Child & Adolescent Health (2019)

Impact of Genetics

- 50 – 90% of our risk for obesity comes from our genes
  - Some people are at greater risk for developing obesity and some are at less risk

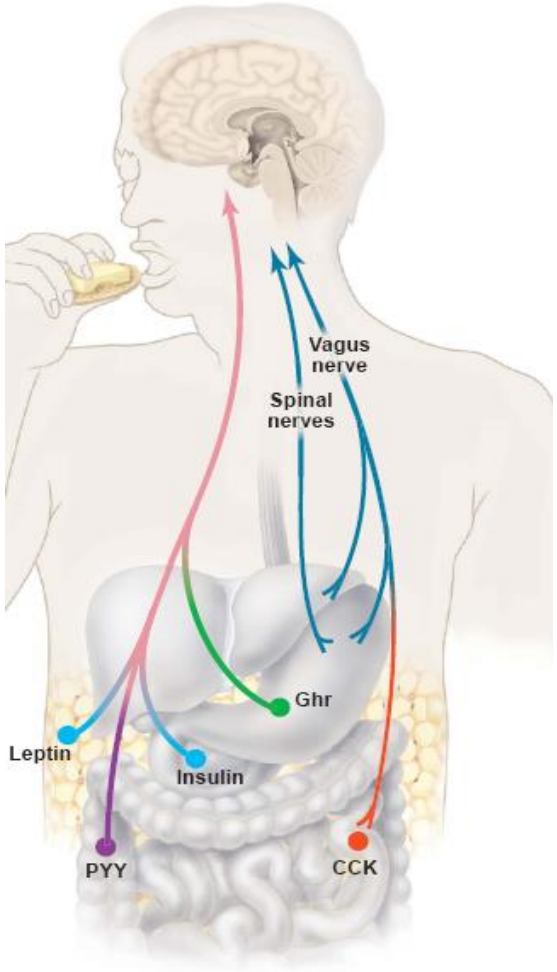
- Epigenetic Changes:
  - Pregnancy and birth factors
  - Gut microbiome/exposure to antibiotics
  - Trauma (intergenerational)
  - Environmental exposures

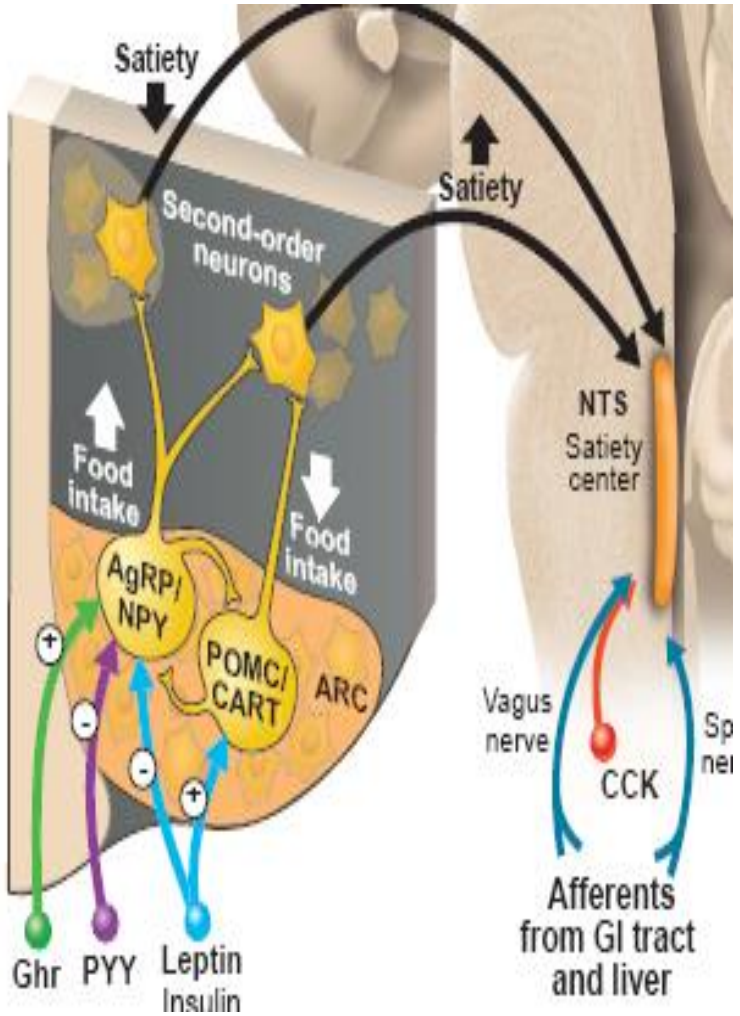


Sensitivity to weight promoting environments and behaviours modified through genetic and pre-natal programming

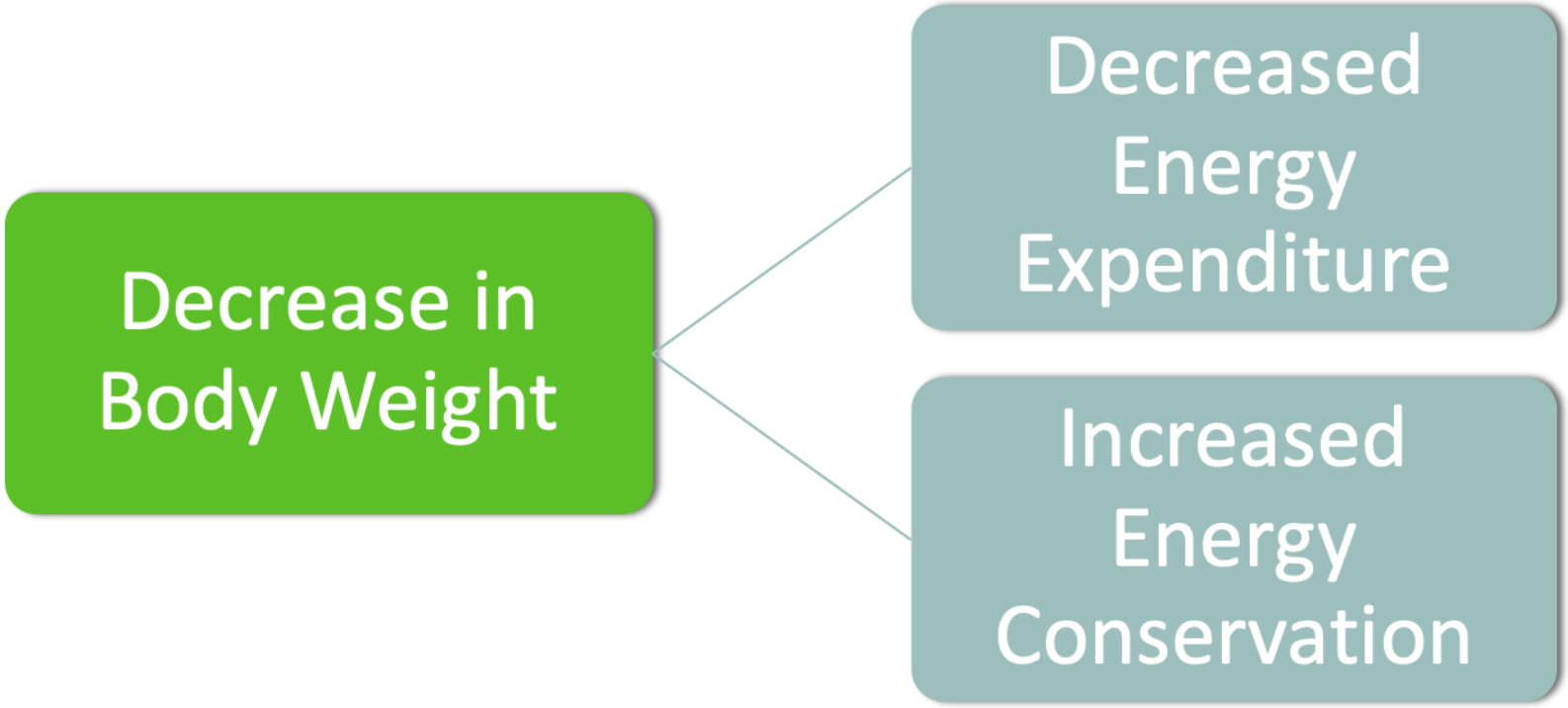
Beyerlein et al, PLoS one (2011)

Neuroendocrine Control of Energy Balance





Science, Feb 7, 2003



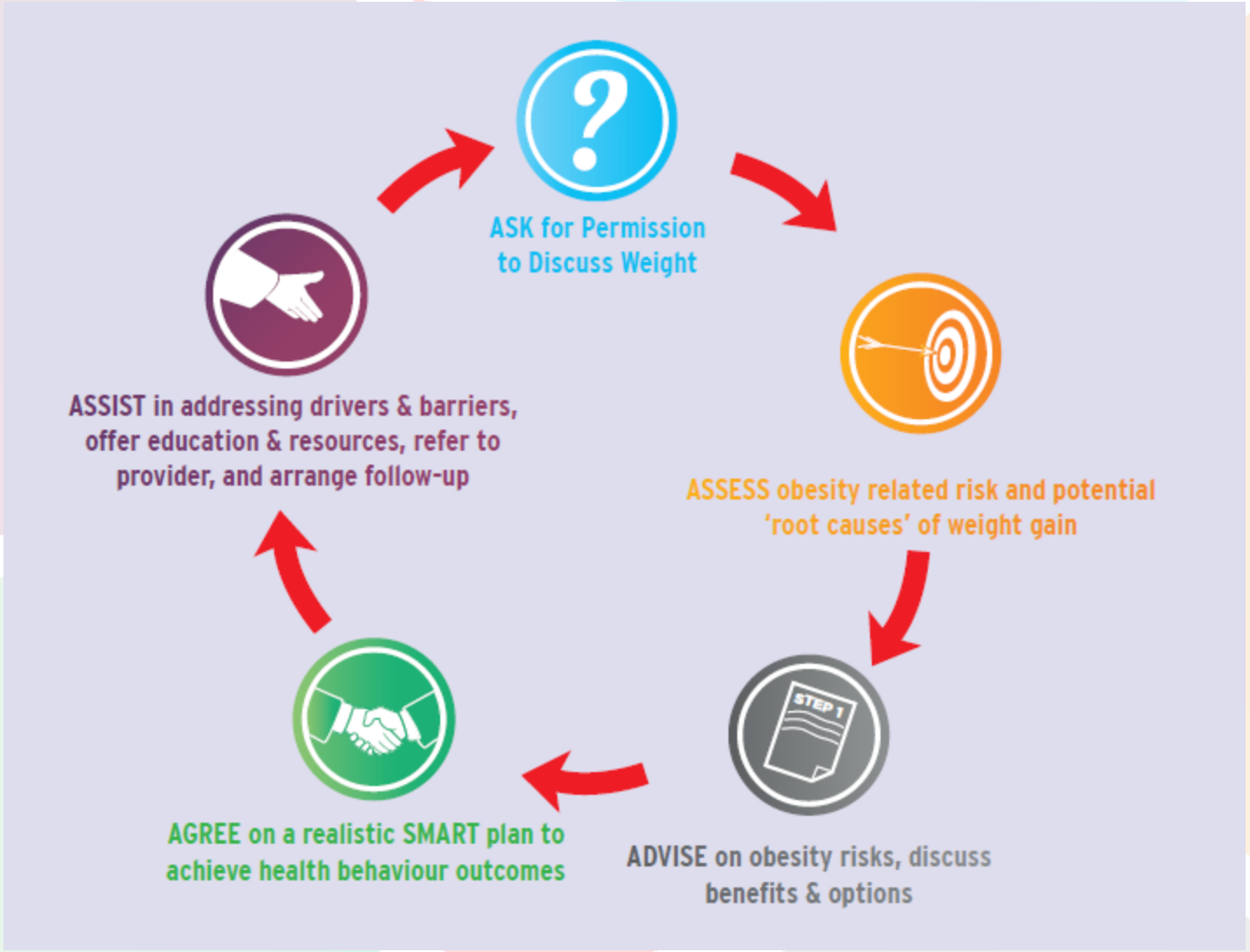
Additional weight loss can only be achieved by a more severe diet and further increases in physical activity

Katan B et al JAMA (2010)

Expected changes in weight

	Lifestyle	Medication	Surgery
Change in weight	1 to 5%	2 to 15%	20 to 40%

USPSTF Task Force, Pediatrics (2010)
Journal of Pediatric Surgery (2010)
Boland et al, Annals of Pharmacotherapy (2015)


ASK for Permission to Discuss Weight
ASSESS obesity related risk and potential 'root causes' of weight gain
STEP 1
ADVISE on obesity risks, discuss benefits & options
AGREE on a realistic SMART plan to achieve health behaviour outcomes
ASSIST in addressing drivers & barriers, offer education & resources, refer to provider, and arrange follow-up

ASK for permission to discuss weight

Weight is a sensitive issue. Many children and parents may be embarrassed or fear blame and stigma, so ‘asking’ is an important first step.

When ASKing…

ASK

- Do you have any concerns about your/your child's health?
- Do you have any concerns about your/your child's weight?
  - What are your concerns about your/your child's weight?
  - How does your/your child's weight impact you/them?

ASSESS obesity related risk and potential 'root causes' of weight gain

ASSESS

Create a Weight-Friendly Practice

- **Facilities:** wide doors, large restrooms, floor-mounted toilets
- **Scales:** over 350lb/160kg, wheel-on accessible, located in private area and used with sensitive weighing procedures
- **Waiting room:** sturdy, armless chairs, appropriate reading material – no glossy fashion magazines
- **Exam room**: appropriate-sized gowns, wide and sturdy exam tables, extra-large blood pressure cuffs, longer needles and turniquets, long-handled shoe horns

Obesity Class
BMI for age percentiles

Obesity Stages (EOSS-P*)

3 Uncontrolled Chronic Disease

2 Chronic Disease

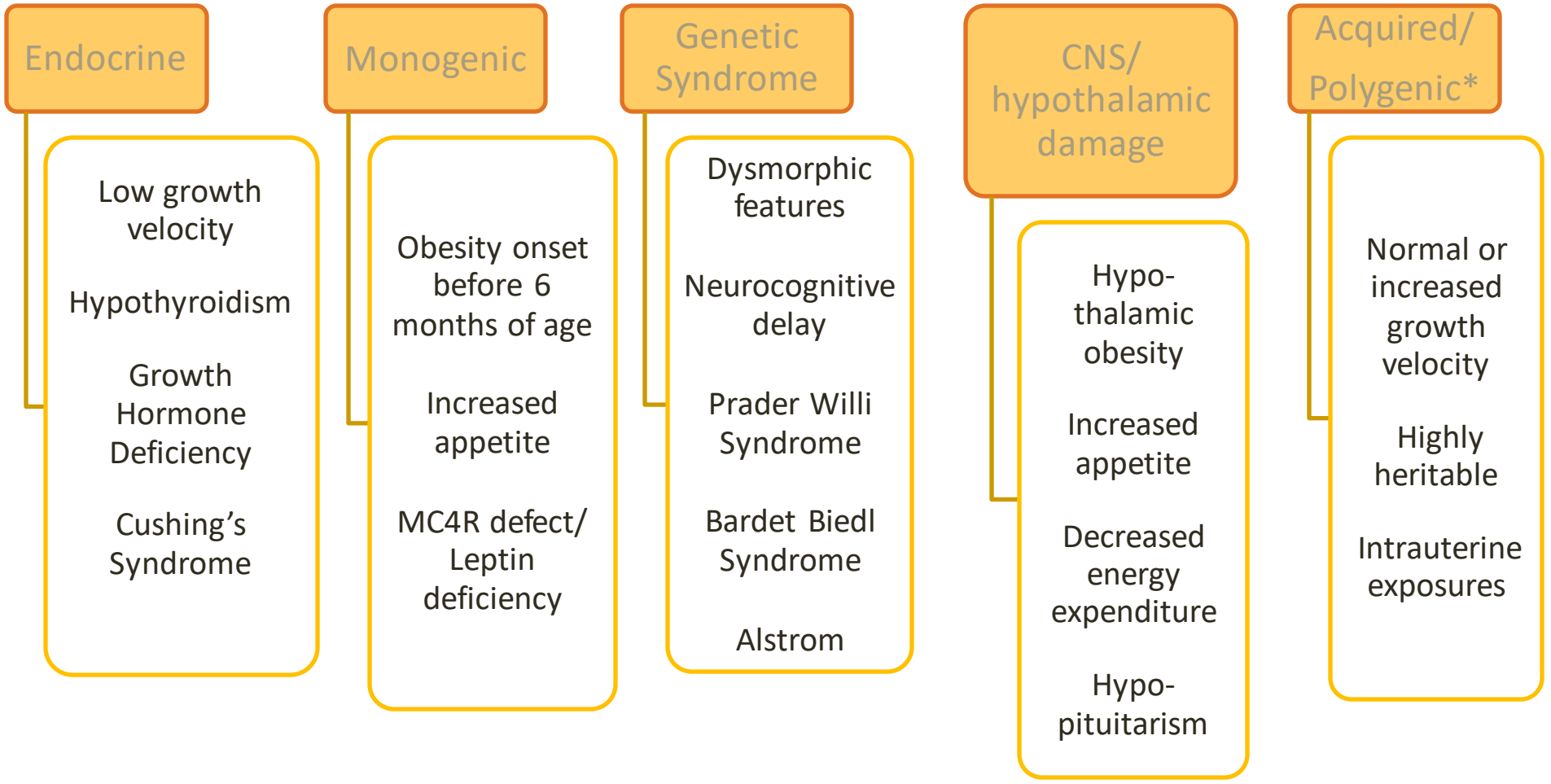
1 Subclinical Risk Factors

0 No Apparent Risk Factors

* Edmonton Obesity Staging System - Pediatrics

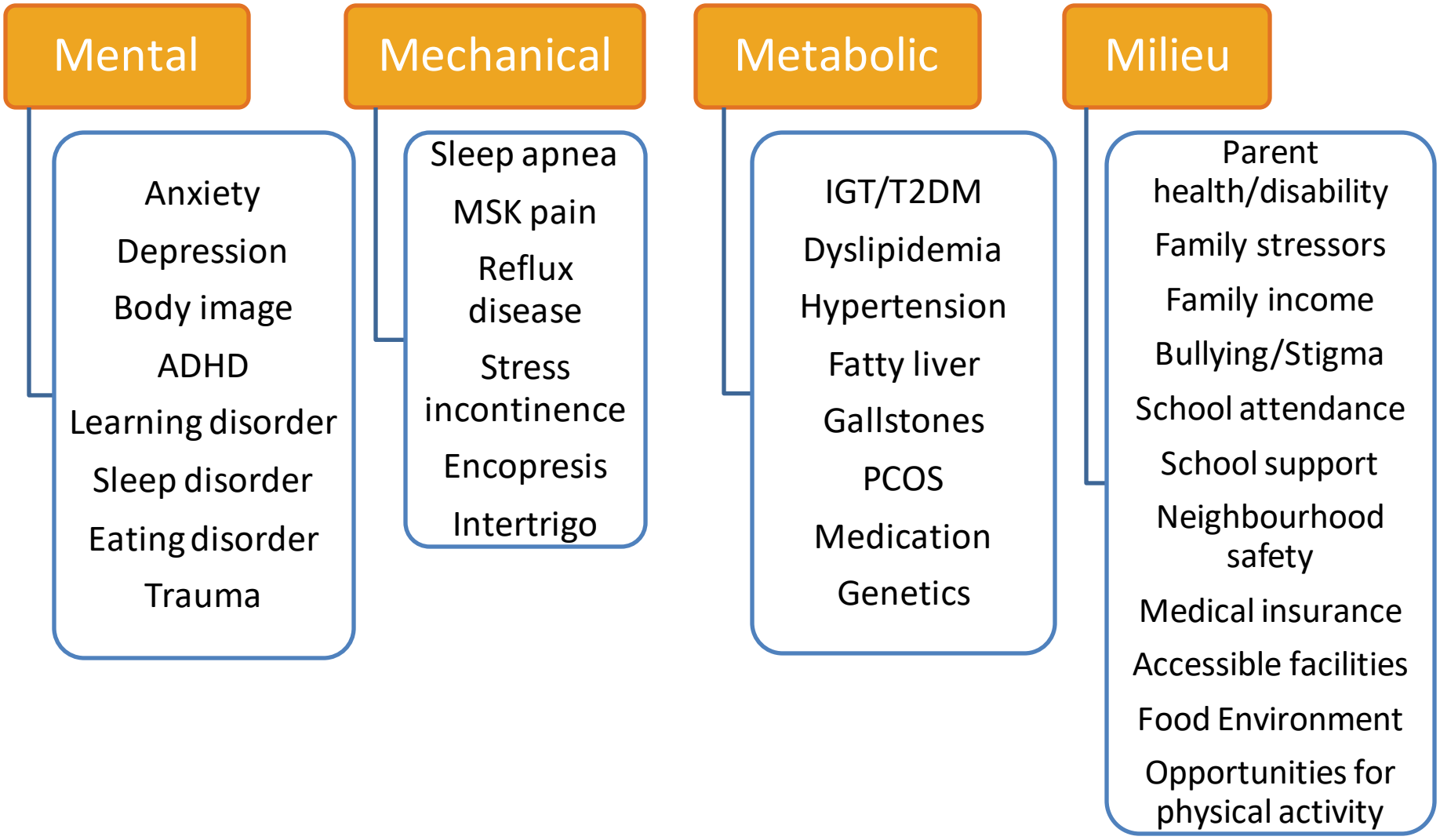
Etiology of Pediatric Obesity

ASSESS



*most common form of pediatric obesity

The 4 M's of Pediatric Obesity



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Jeff -12 yo BMI 32 kg/m2- Class II Obesity

Mental

No mood or anxiety concerns

No learning difficulties or developmental concerns

Positive body image

No emotional or binge eating

Stage 0

Mechanical

No MSK concerns

No symptoms of OSA

No mobility difficulties

Stage 0

Metabolic

Normal blood pressure

No Acanthosis Nigricans

Normal blood sugars, A1C, lipid profile, liver enzymes

Stage 0

Milieu

Well supported at home and at school

Good opportunities for activity

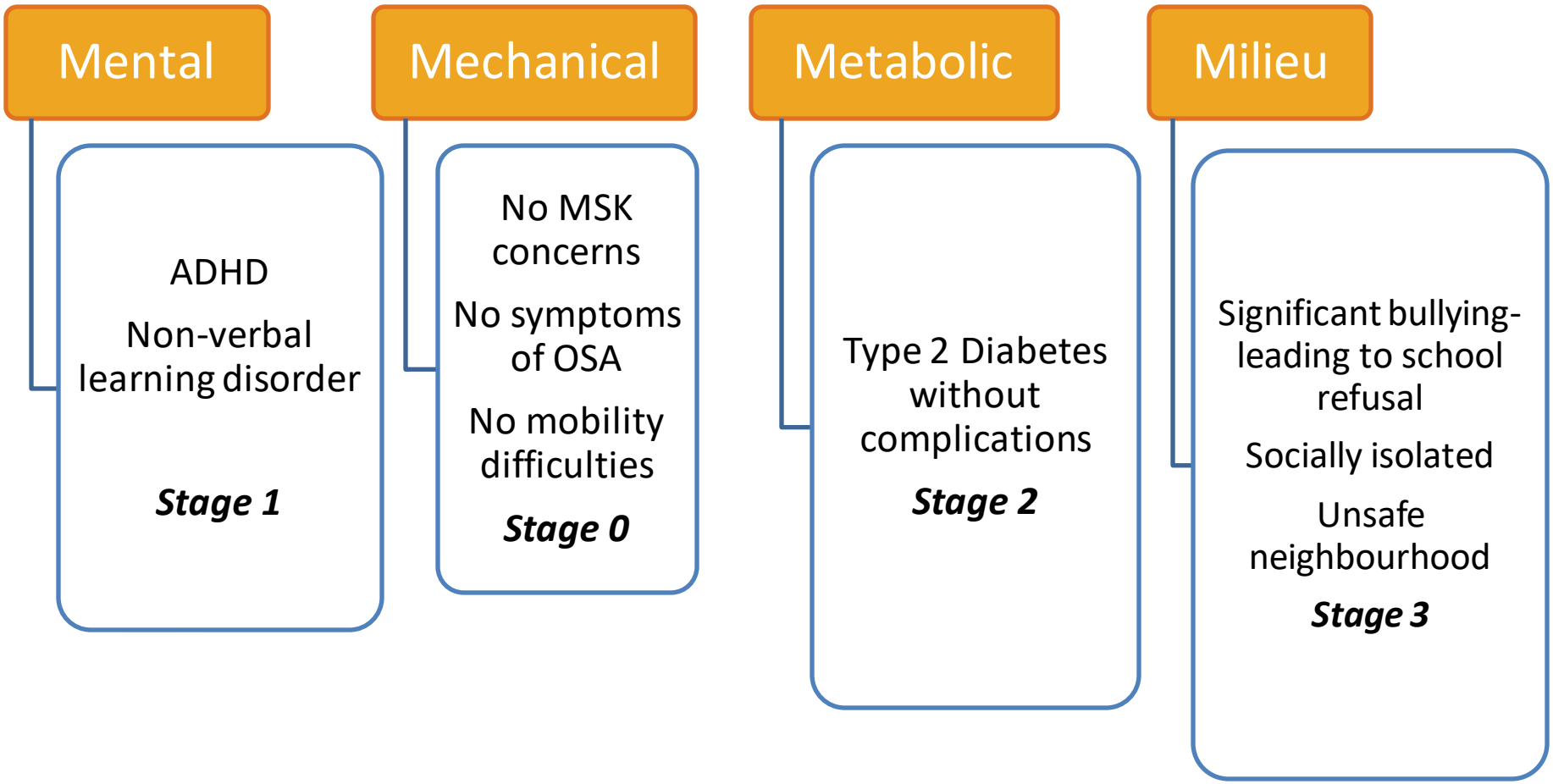
Healthy home food environment

No active familial stressors

Stage 0

EOSS-P Stage 0

Aaron -12 yo BMI 32 kg/m2- Class II Obesity



EOSS-P Stage 3

Oscar 15 yo, male, BMI 44 kg/m^2

Mental	Mechanical	Metabolic	Milieu
ADHD (untreated) Nonverbal Learning Disability (stage 2)	Sleep apnea non-adherent with BiPAP (stage 2)	Type 2 Diabetes (A1C 12.2) Dyslipidemia (stage 3)	Combined family income (< $25000) maternal type 2 diabetes-complications maternal eating disorder Bullied at school School refusal Frequent suspensions (stage 3)

EOSS-P Stage 3

Obesity Complications, Barriers & Drivers- *OSCAR*

Metabolic	**Type 2 Diabetes with high A1C – 12.2 Dyslipidemia**
Mechanical	**OSA- non-adherent with BiPAP**
Mental Health	**ADHD (not on treatment), non- verbal LD**
Milieu	**School refusal- frequent suspensions, detentions, maternal diabetes with complications, maternal eating disorder, household income less than $25,000/year**
Drivers	Skipped breakfast and lunch- with high hunger later in the day, Lack of formal meals and snacks, High Sweetened Beverage Consumption, Untreated ADHD, Insufficient Sleep
Barriers	Financial Limitations, Inadequately treated OSA, Untreated ADHD, Maternal Health and Mental Health Issues

4 Pillars of Lifestyle Interventions

Mental Health	• Stress management • Body image • Self-confidence • Manage mood & mental health
Nutrition	• When, where & who we eat with • Hunger management – keeping our bodies fueled • Healthy relationship with food
Sleep	• Regular sleep & wake time • Good quantity & quality of sleep
Activity	• Opportunities for organized & free play • Manage screen time

- Choose long-term strategies & sustainable behaviours
- Avoiding “quick-fixes”

Advise on Family-Based Management Options

ADVISE

Sleep	• management interventions can significantly improve eating and activity behaviours as well as mood and school performance.
Eating Behaviours	• should focus on eating & drinking hygiene. Extreme and “fad” diets are not sustainable in the long-term.
Physical Activity	• interventions should aim at reducing sedentariness and increasing daily physical activity levels to promote fitness, overall health, and general well-being , rather than focusing on “burning calories”.

Advise on Family-Based Management Options

ADVISE

Sedentary Behaviour	• should be limited through minimizing recreational screen time to less than 2 hours per day, choosing active transportation over motorized, and increasing active play and active family time.
Mental Health	• treatment referrals to help manage underlying /co-morbid psychological issues • interventions can improve body-esteem, self-esteem, reduce emotional eating, and promote coping strategies.
Bariatric Surgery	• may be considered for adolescents who've reached their final adult height, with BMI>40, and with obesity related health complications. Candidates & their families are required to have completed a multidisciplinary 6-month presurgical intervention.

Pharmacotherapy

Setmelanotide/Imcivree (FDA)

- Age 6 and older with:
  - POMC deficiency
  - PCSK1 deficiency (impaired POMC processing)
    - Obesity; malabsorptive diarrhea; hypogonadotropic hypogonadism; altered thyroid and adrenal function
  - Leptin Receptor Deficiency
  - Bardet Biedl Syndrome
  - Outcomes: 80% lost more than 10% of their body weight

Pharmacotherapy (GLP-1 Agonists)

Liraglutide (3 mg sc daily) (FDA and Health Canada):

- Age 12- 17, body weight of >60 kg; BMI > 30 kg/m2 or > 27 kg/m2 with at least one weight related comorbidity
- Reduction in BMI of at least 5% in 45%

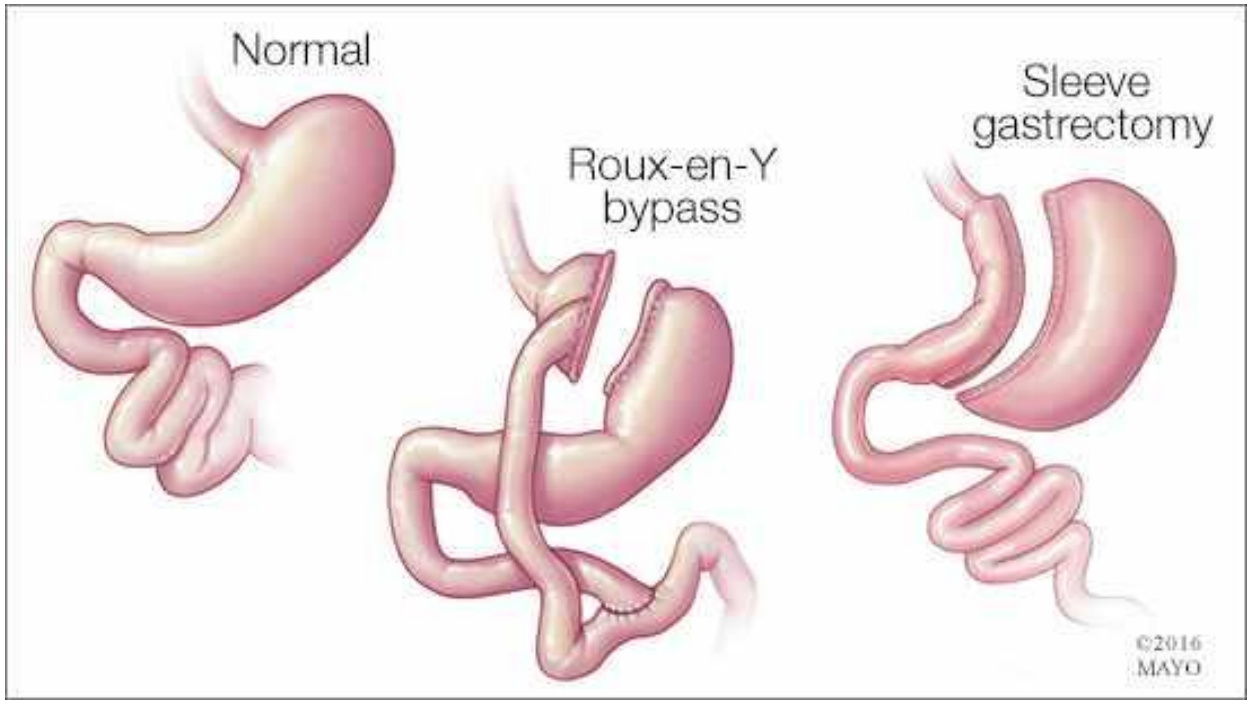
Semaglutide 2.4 mg sc weekly – (FDA Approval)

- Age 12- 17, body weight of >60 kg; BMI > 30 kg/m2 or > 27 kg/m2 with at least one weight related comorbidity
- Mean change in BMI 16.1%
- A BMI reduction of at least 5% in 77%

Pharmacotherapy in Canada

- Liraglutide/Saxenda/Victoza (GLP-1 agonist)- Approved for 12 + years of age for weight management and 18+ years of age for T2DM
- Semaglutide/Ozempic/Wegovy- (GLP-1 agonist)- Approved for 18 + years of age for weight management and Type 2 Diabetes
- Naltrexone-buproprion/Contrave- Approved for 18 + years of age for weight management
- Orlistat/Xenical- Approved for 12 + years of age for weight management

Bariatric Surgery



Bariatric Surgery

- BMI greater than 35 kg/m2- clinically significant complications (OSA; T2DM; IIH, NAFLD, Blount Disease, SCFE, GERD, HTN)
- BMI greater than 40 kg/m2
- Outcomes (3 years):
  - 29% reduction in weight (mean 8 year follow up)
  - 95% resolution of T2DM
  - 74% resolution of HTN
  - 66% resolution of dyslipidemia
- Complications
  - Mortality – 0.3%
  - Minor surgical complications – 15%
  - Major surgical complications - 8%
  - Micronutrient deficiencies- (Fe – 66%; B12 8%; folate 6%)

AGREE on realistic weight-loss expectations and on a SMART plan to achieve behavioural goals

ASSIST in addressing drivers & barriers, offer education & resources, refer to provider, and arrange follow-up

AGREE

- Agree on Behaviour Change Outcomes
- Agree on Sustainable Behavioural Goals and Health Outcomes
- Agree on Management Plan

ASSIST

- Assist Families in Identifying and Addressing Drivers and Barriers
- Provide Education and Resources
- Refer to Appropriate Provider
- Arrange Follow-Up

Conclusions

- Obesity is a heterogeneous, chronic, often treatment resistant disease

- A comprehensive assessment of Obesity related complications, drivers and barriers is essential in order to guide an effective management plan

5As Team

- Stasia Hadjiyannakis MD, FRCPC
- Annick Buchholz, PhD, CPsych
- Laurie Clark, PhD, CPsych
- Jane Rutherford, MSc
- Geoff Ball, PhD, RD
- Tracey Bridger, MD, FRCPC
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- Arya Sharma, MD, PhD, FRCPC

EOSS-P Team

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- Mary Jetha, MD
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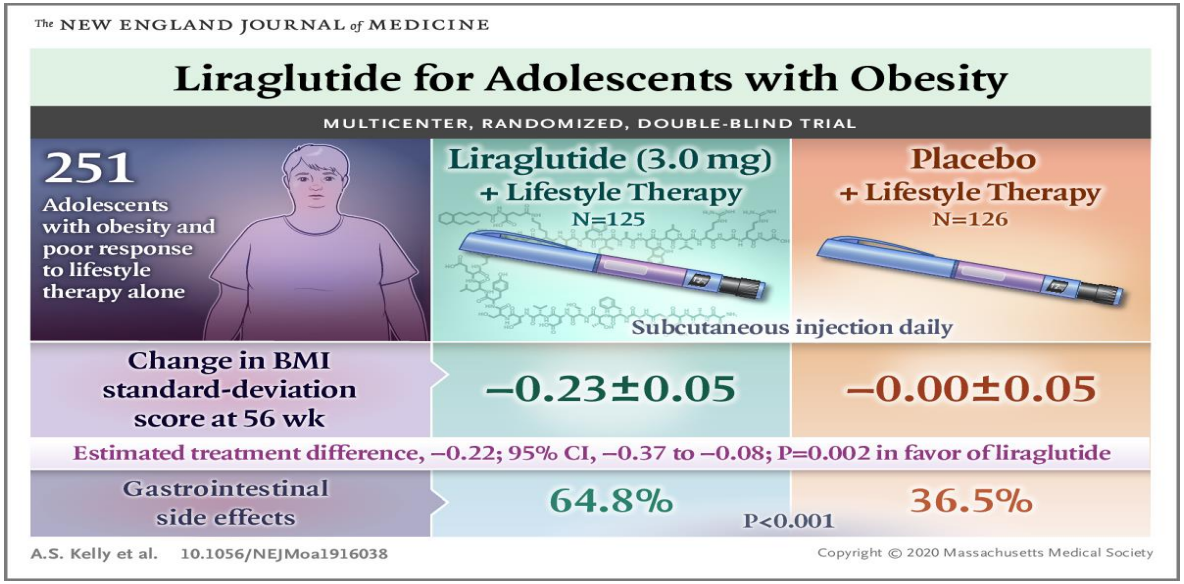
- Catherine Birken, MD
- Katherine Morrison, MD
- Tracey Bridger, MD
- Laurent Legault, MD
- Arya Sharma, MD, PhD
- Geoff Ball, PhD, RD
- John Lyons, PhD, cPsych

Future Directions:

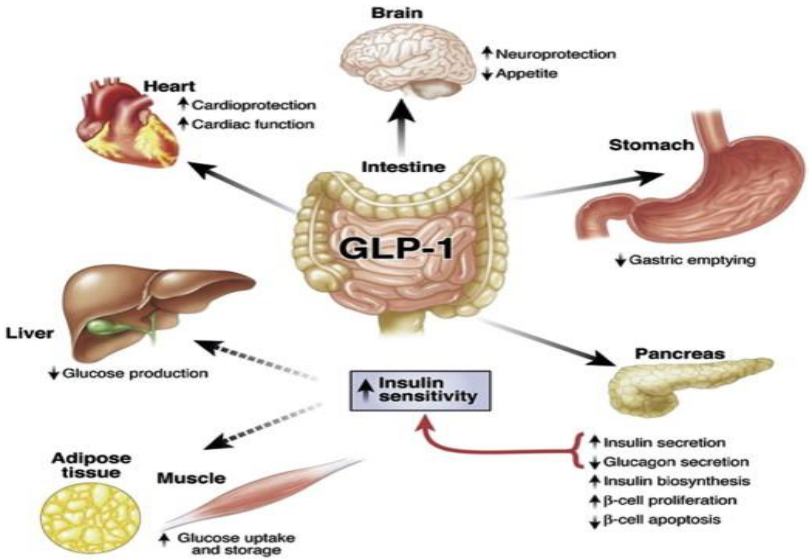
- Kevin Belanger, MSc.
- Kristi Adamo, PhD
- Jane Rutherford, MSc
- Laurie Clark, PhD
- Katie Baldwin, MD
- Charmaine Mohipp, MA
- Mary Ann Matzinger, MD
- Franco Momoli, PhD

Questions?

Liraglutide in youth with obesity



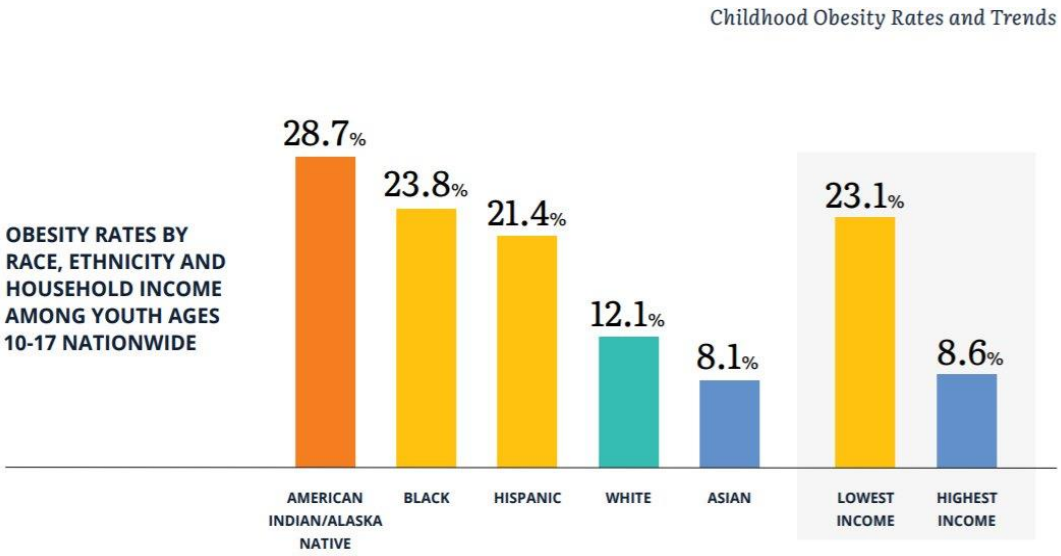
GLP-1 Activity



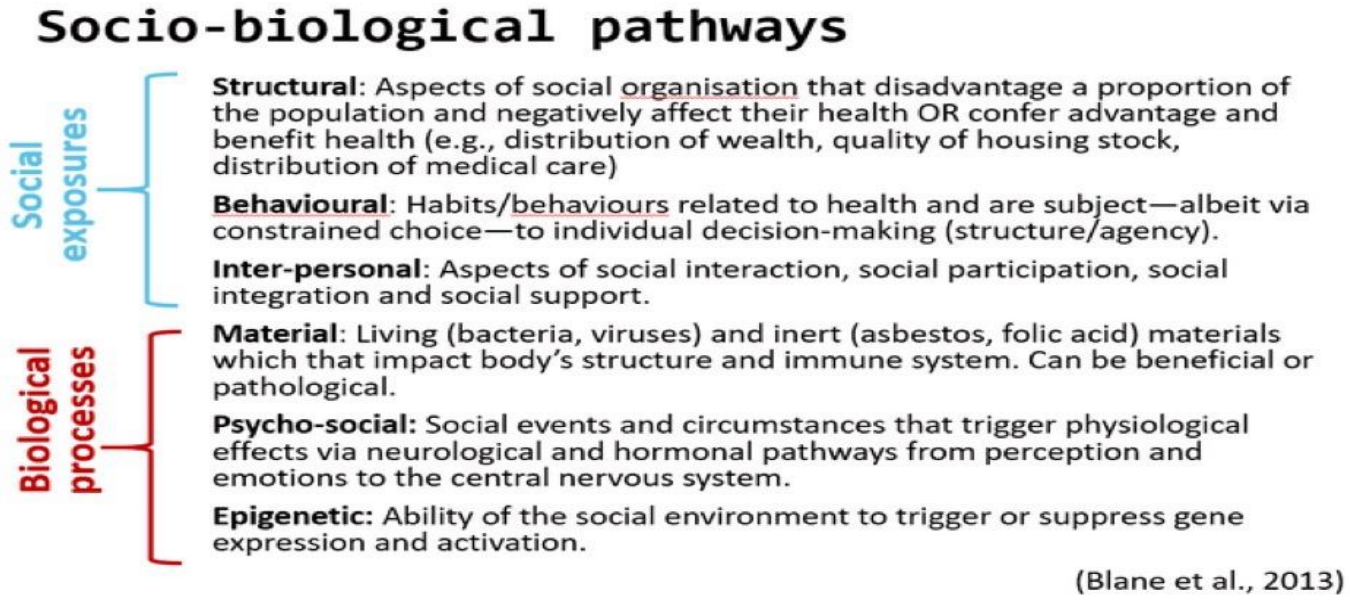
Health Canada Approval- Feb,2021 Saxenda

- Age 12- 17, body weight of >60 kg; BMI > 30 kg/m2 or > 27 kg/m2 with at least one weight related comorbidity
- Reduction in BMI of at least 5% in 45%
- Side effects:
  - Nausea
  - Diarrhea
  - Constipation
- Contraindications
  - Family history of medullary thyroid carcinoma or MEN2
  - Past history of pancreatitis

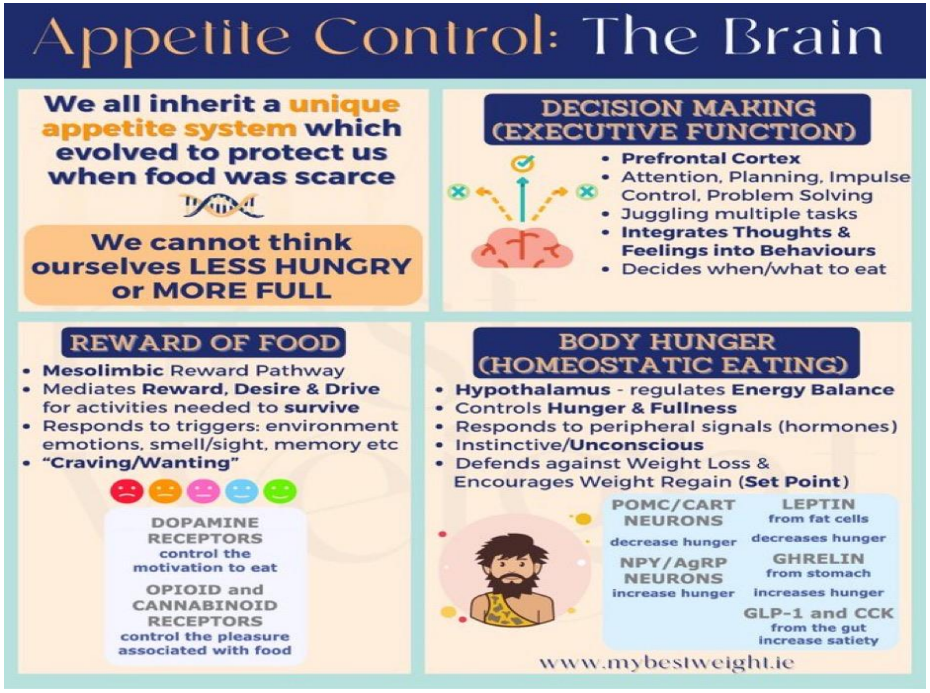
Socio-Demographic factors



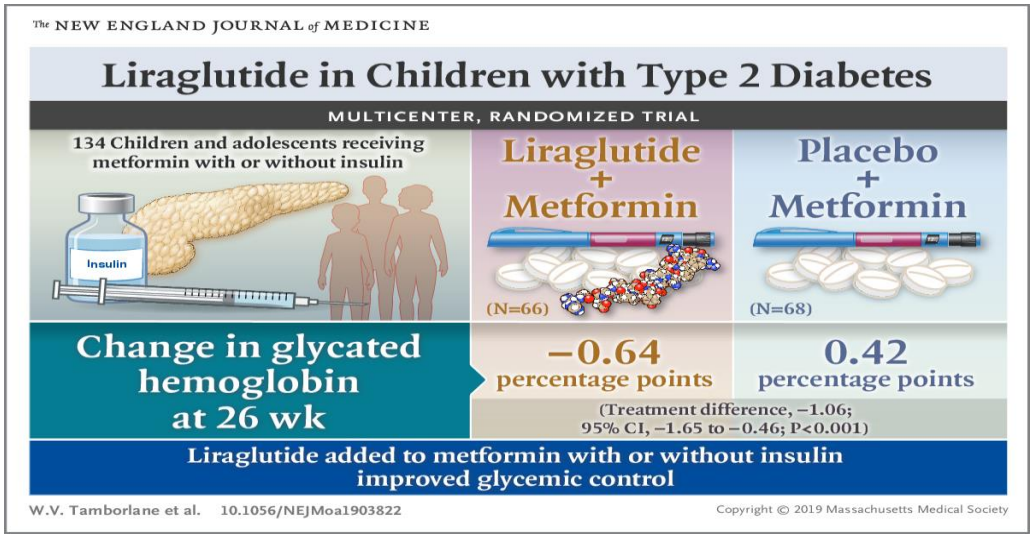
GENE-Environment interaction



Body weight is regulated by THE BRAIN



Liraglutide in youth with T2DM



Melanocortin receptor 4	Most common monogenic form of obesity (5%) of those with severe obesity	Increased linear growth; hyperphagia
Leptin receptor	2-3% of infant severe obesity in consanguineous families	Hyperphagia; early onset obesity; immune dysfunction; central hypothyroidism; hypogonadotropic hypogonadism
Leptin deficiency	1% of infant severe obesity in consanguineous families	Responds to leptin
POMC mutations	Loss of melanocortin signaling, ACTH and MSH deficiency	Adrenal crisis; pale/red hair
PCSK1 mutation	Unable to activity POMC, TRH, proinsulin, proglucagon, proGnRH	Small bowel enteropathy, FTT in infancy; severe obesity and multiple endocrinopathies
SIM1 mutations	Transcription factor in PVN	Hyperphagia; subset with ASD
Brain Derived Neurotrophic factor (BDNF)	Unclear mechanism	Severe obesity; neurocognitive delay
16p11.2 deletion	Involved in leptin and insulin signaling	Developmental delay;ASD; severe obesity; severe insulin resistiance
6q16 deletion	Impact SIM1	PWS like; hypopit; severe obesity