Swimming Towards the Tsunami

Lessons from Building an Early Pediatric Weight-Management Program

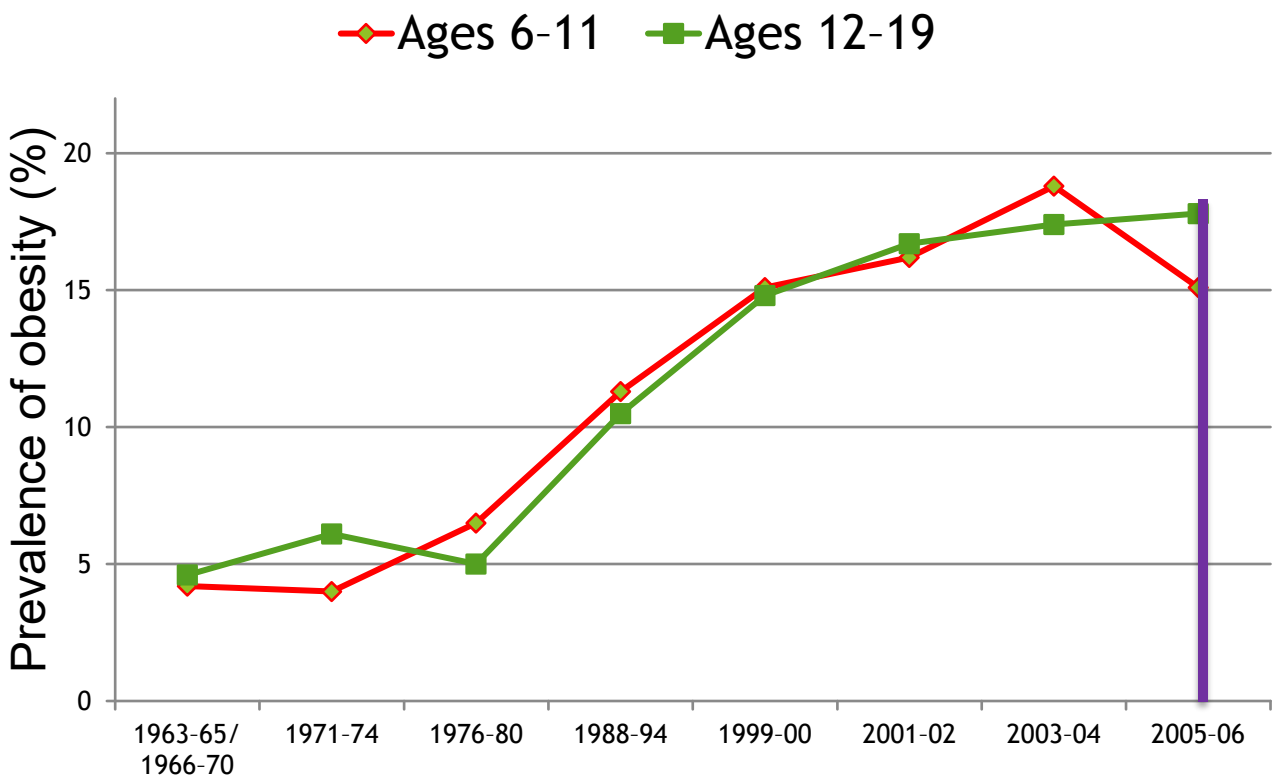


Nazrat Mirza, MD, ScD

Objectives

- Describe the evolution from a community-based obesity intervention to a comprehensive pediatric weight-management clinic, and the unmet clinical needs that drove that transition
- Identify clinical, institutional, and financial barriers to developing pediatric obesity care, and approaches used to overcome them
- Examine the development of a multidisciplinary continuum of care for children and adolescents with obesity, from lifestyle and behavioral treatment to pharmacotherapy and metabolic/bariatric surgery
- Apply lessons learned from the challenges, successes, and changing treatment landscape of pediatric obesity care over the past two decades

The Tsunami Was Coming



Source: CDC/NCHS, NHES and NHANES. Obesity defined using CDC age- and sex-specific BMI criteria

** in 2004 we surveyed our patient population in our primary care clinic and found that 48% of our patients ages 2-12 years had overweight or obesity

“The last thing a fish would ever notice would be water” ★

- What we see every day can gradually become what we consider normal



★ Ralph Linton

In 2006, This Was Far from Self-Evident

“I can see the train getting off the tracks”

- Little support for establishing a clinical obesity service
- No dedicated clinic space
- “why dedicate resources to something no one cares about”?
- “they will not come”
- Strong advice not to pursue obesity research

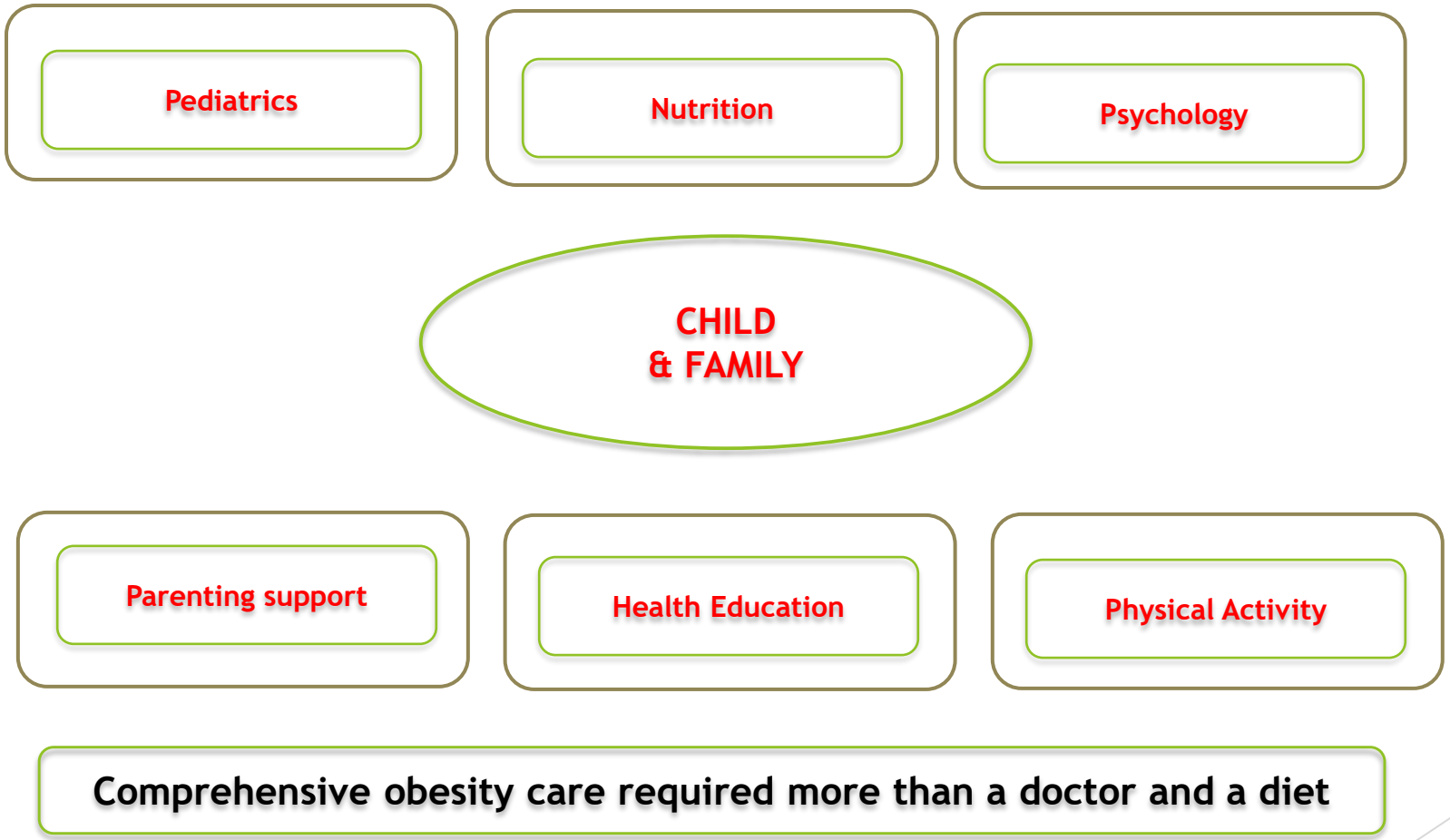
Resistance did not necessarily mean the clinical need was not real

When we conducted a survey among our patients and their families these are some of the things we heard ….

- The parents were concerned about their weight, so were the older children
- Interest in attending a clinic to help with the weight management of their children

** In our survey of our patient population, **82% of the parents with children who were overweight expressed an interes**t in having a Weight Management clinic where weight for their child could be addressed**

We Had the Model — But Not the Infrastructure



Comprehensive obesity care required more than a doctor and a diet

We Had a Clinic — But We Didn't Yet Belong

3 rooms • 3 hours • Monday afternoons

- Difficulty getting patients registered and “arrived”
- Inconsistent nursing and vital-sign support
- No hospital dietitian or physical-activity support
- We were rushed out when our three hours were over

“Your chubby club is here.”

And Yet, They Kept Coming

We never advertised

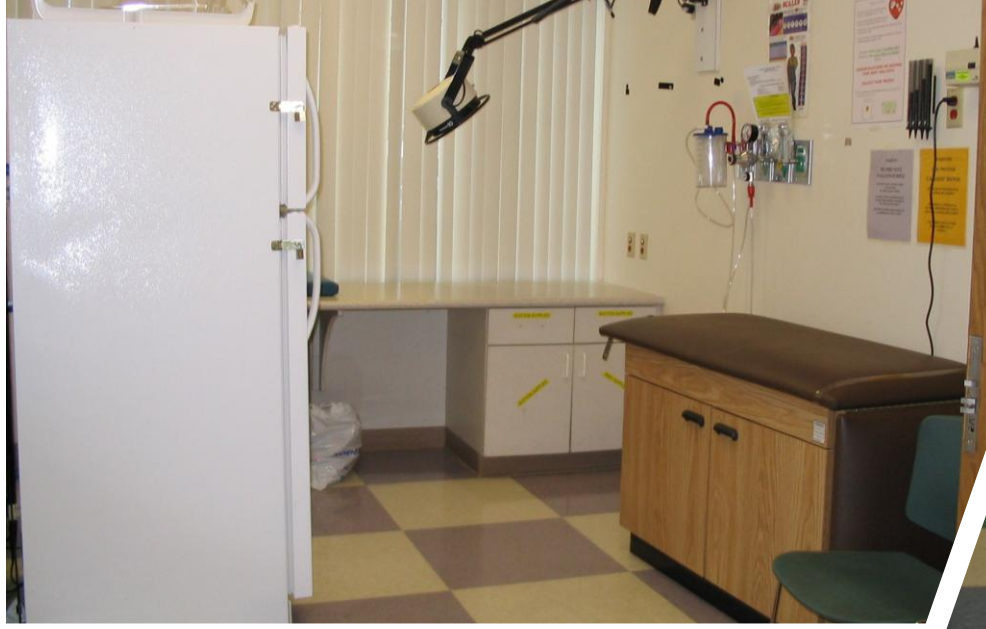
- ~ 600 patients on the waiting list
  - within the first few months

Perhaps nothing demonstrated the unmet need more clearly

When the Usual Path Was Blocked, We Found Another

- Hospital dietitian unavailable → grant-funded dietitians
- Physiotherapy declined → personal trainer (grant funded)
- Psychology support difficult → found outside (grant funded)/volunteer expertise
- Scheduling overwhelmed → grant-funded administrative assistant

We couldn't wait for the institution to be ready before caring for the children who were already there








PLEASE RETURN TO RM. 2157

Clinical Need Became a Business Case

- Many patients had extremely high BMIs and serious obesity-related complications
- We identified adolescents potentially suitable for bariatric surgery
- We presented the Chief of Surgery with our caseload and a business plan
- Bariatric surgery aligned clinical need with a service the hospital could sustain

Persistence started the clinic. Institutional alignment helped it grow

Finally, A Clinic of Our Own

An underused Regional Outpatient Center

Our colleagues laughed…
We were thrilled….

- Two weight-management clinic days each week
- Excellent show rate and growing volume
- Other subspecialties began returning to the clinic site
- Eventually, the facility became too small

From Outsider to Equal Partner

2006
3 borrowed rooms
3 hours/week

→

Next
Dedicated regional clinic
2 days/week

→

Growth
Multidisciplinary services
Bariatric program

→

Today
7 clinical sites across the CNH system

When new sites were needed, weight management was now accommodated as an equal partner

From the Margins to the Mainstream

2006

Pediatric obesity care struggled for recognition, resources — and even clinic space

→

2023

AAP Clinical Practice Guidelines for the Evaluation and Treatment of Children and Adolescents With Obesity

Invited member of the AAP Clinical Practice Guideline committee

The field had changed

What Were We Really Providing?

A medical home for children and adolescents with obesity

- Identifying and managing medical complications
- Nutrition and eating behaviors
- Physical activity and physical limitations
- Depression, anxiety, and psychological concerns
- Family and parenting issues
- Treatment options beyond lifestyle intervention

The goal was not simply weight loss. It was comprehensive care of the child

An Epidemic in Prevalence — An Orphan in Treatment

- Lifestyle intervention was essential — but often insufficient for the severity we were seeing
- Orlistat was approved for older adolescents, but effectiveness, tolerability, adherence and coverage limited its usefulness
- For selected patients, we cautiously used adult medications off-label after discussion with adolescents and parents
- We established pediatric bariatric surgery; most procedures at our center were sleeve gastrectomy

We treated the disease in front of us with the tools we had

Having a Treatment ≠ Having Access

THEN	NOW
Very few practical pediatric drug options	Much more effective approved pharmacotherapy
Off-label therapies difficult to cover	Coverage remains inconsistent
Out-of-pocket cost excluded many families	Cost can still determine who gets treated

The therapeutic toolbox has changed dramatically. Access has not kept pace

Perhaps Our Most Important Success

NO SHAMING. NO BLAMING

- If you lost weight – we celebrated with you
- If you did not lose weight – we kept working with you
- If you gained weight – we still welcomed you back

The child was never the failure

What Did 20 Years Teach Us?

- Obesity is a chronic disease — not a failure of willpower
- Lifestyle matters, but lifestyle intervention alone is often not enough
- Biology strongly influences weight regulation and response to treatment
- Severe obesity deserves the same seriousness as other chronic diseases
- Treatment must be individualized: lifestyle, behavioral care, pharmacotherapy and/or surgery

Treat the disease. Don't blame the patient

The Tsunami Arrived
Fortunately, Treatment Changed

2006	TODAY
Lifestyle-centered care	Obesity recognized increasingly as chronic disease
Very limited pharmacotherapy	More effective pediatric pharmacotherapy
Off-label adult medications	Metabolic/bariatric surgery established
Bariatric surgery for selected adolescents	Multidisciplinary care more accepted
Limited institutional recognition	But access, cost and stigma persist

The children did not suddenly become more deserving of treatment when better treatments arrived

IDEAL Clinic 2006 vs 2026

	2006	2025
# of clinical site(s)	1	7
# of clinical hours provided/ week	3	108
# of clinical providers FTE	0.2 FTE (2 MDs)	2.8 FTE (4 MDs); 2.85 FTE (NPs)
# of Dietitians	0.2 FTE (2 RDs, grant supported)	1.98 FTE (4 RDs, 1 RD on philanthropy)
# of psychologists	0.1 FTE psychologist (grant supported)	0.5 FTE
Personal trainer / physiotherapy	1 hour/week (grant supported)	--
Administrative support	1.0 FTE Research assistant (grant support)	1.0 FTE manager & 1.0 Admin assistant
# of patient visits/yr	450	4,440

What Would I Tell Myself in 2006?

- See the child — not just the weight
- Don't wait for everyone to agree that the problem is important
- When one path is blocked, look for another
- Build allies — clinical, institutional and financial
- Never underestimate what families tell you simply by showing up

“The last thing a fish would ever notice would be water”

- What we see every day can gradually become what we consider normal
- Sometimes it takes a different lens to recognize that what has become normal should not be accepted as normal

What have our eyes become accustomed to seeing today?


Happy
20th
ANNIVERSARY!
Congratulations!!!

WRONG PLACE. WRONG TIME.

The Cardiometabolic Consequences of Misplaced Lipid

Michele Mietus-Snyder, MD, FAHA
Preventive Cardiologist
Center for Health Outcomes Research and Delivery Science



Children's National®



Objectives

TO REVIEW

- Why FAT is not a 4-letter word
- Why lipid biomarkers are first responders when fat goes rogue
  - Atherogenic combined hyperlipidemia – an early RED FLAG
- Best evidence-based therapies
- When to refer to Preventive Cardiology

Critical and Healthy Lipid Functions

1. ENERGY STORAGE



Adipose (fat) tissue

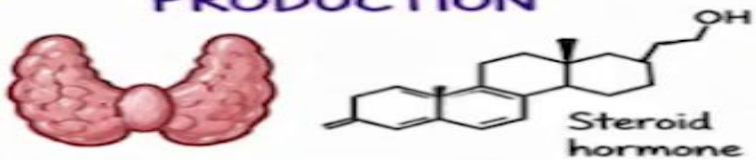
Lipoproteins deliver lipids for long-term energy storage



... and back-burner mitochondrial fuel

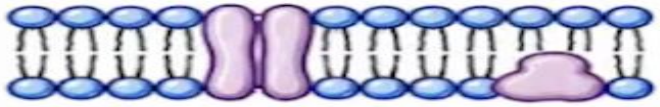


2. HORMONE PRODUCTION



Cholesterol is used to make hormones.

3. CELL MEMBRANE STRUCTURE

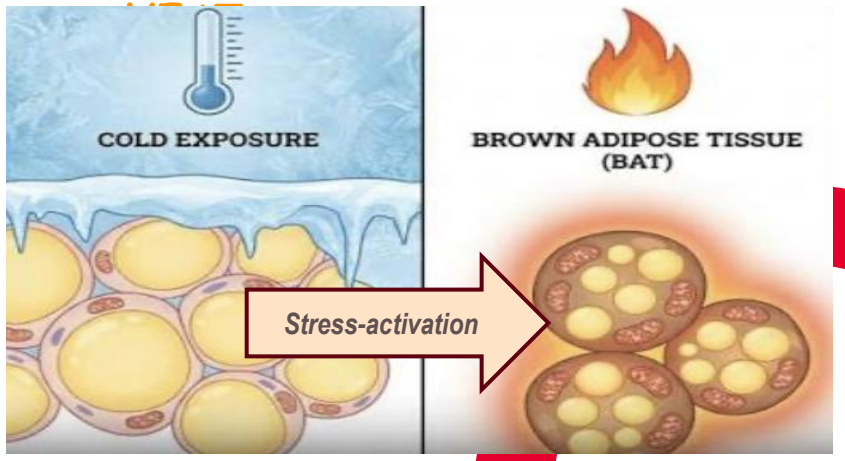


Lipoproteins supply lipids for building and repairing cell membranes.

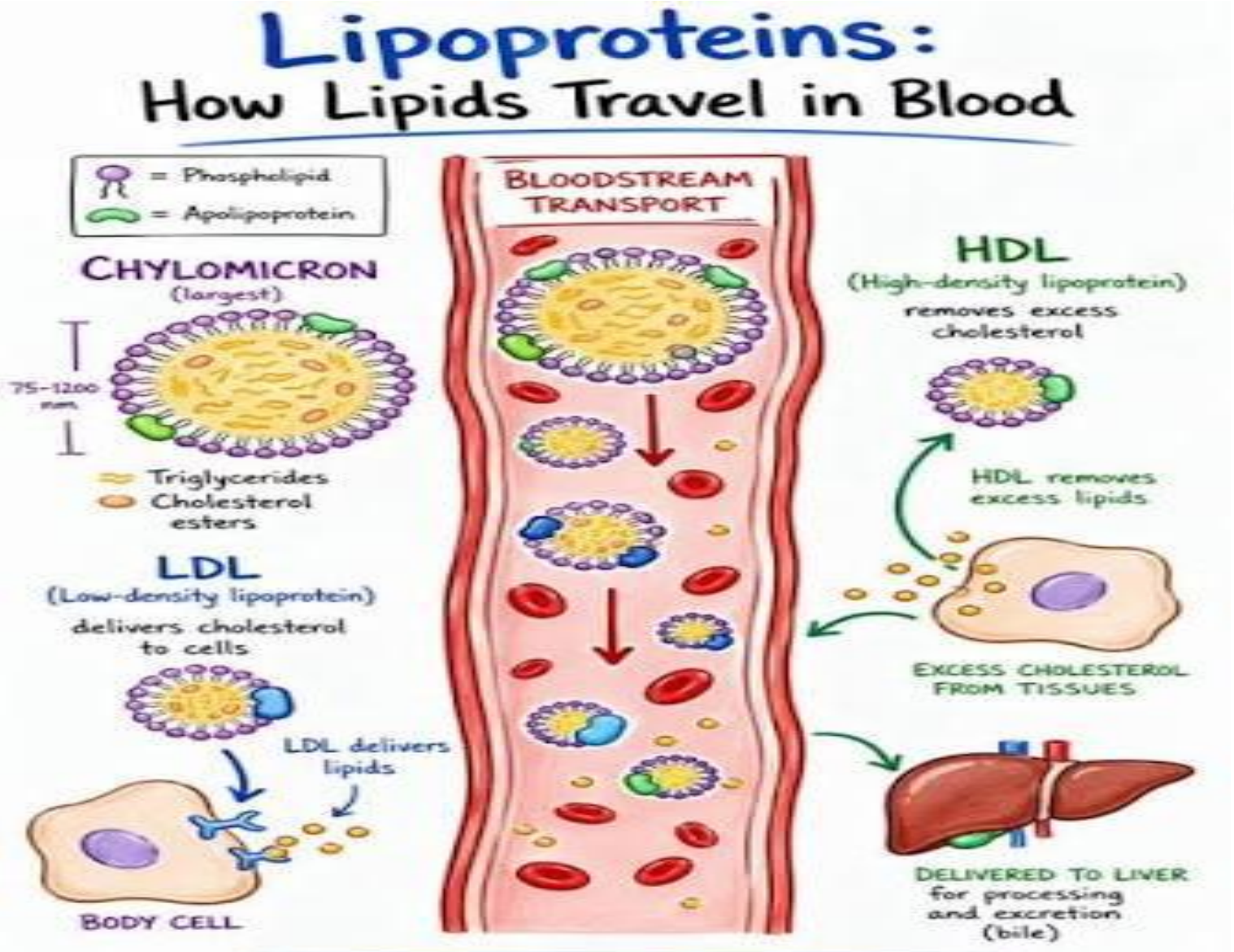
4. FAT SOLUBLE VITAMIN ABSORPTION



5. INSULATION &

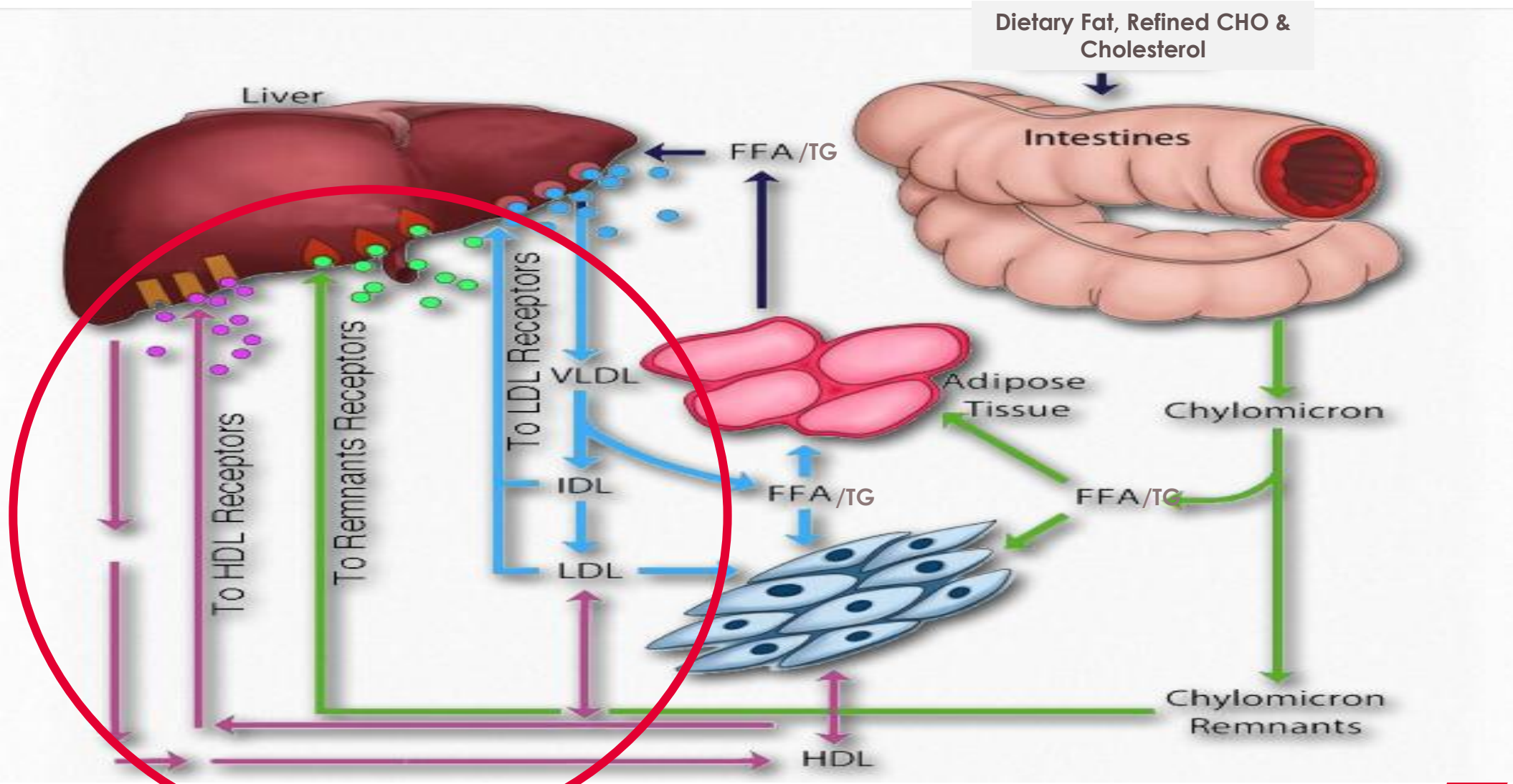


Lipoprotein Packages Navigate our Aqueous Environment





DIET-ADIPOSE-LIVER-LIPID INTERCONNECTIONS



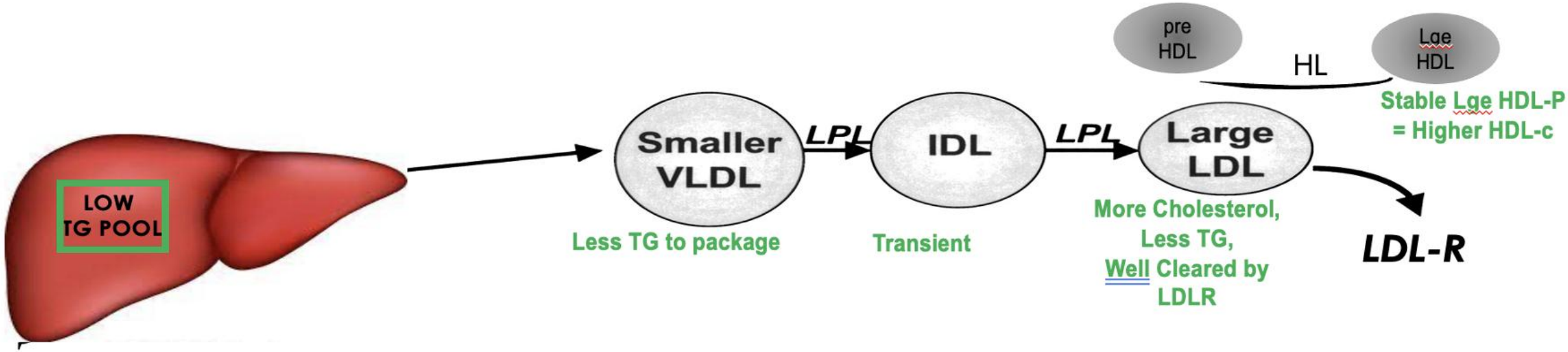
Green = exogenous pathway; **Blue** = endogenous pathway; **Purple** = reverse transport pathway

Image by Aleia K, LibreTexts

TC = LDL-c + HDL-c + VLDL-c… & *nonHDL-c = TC – HDL-c*

= mostly TG

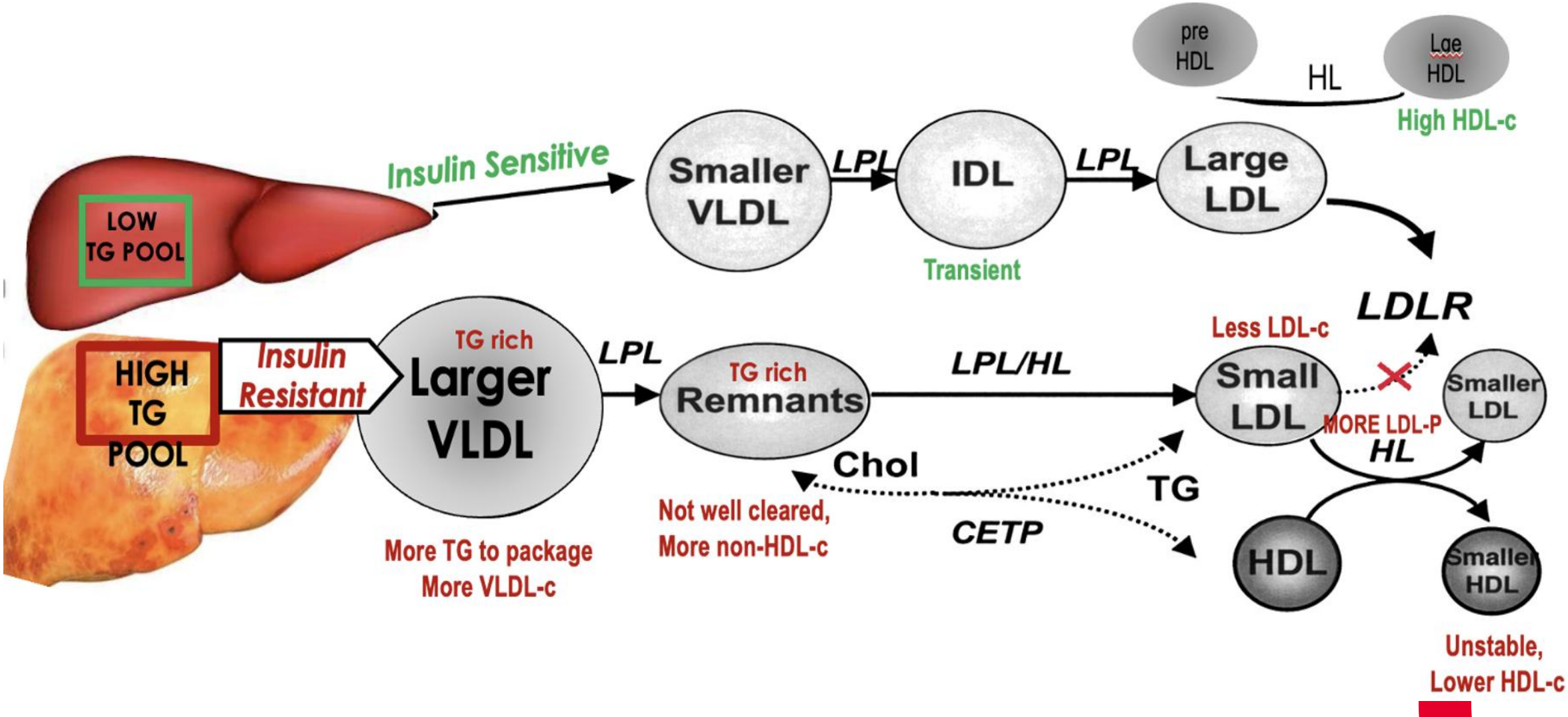
In an insulin sensitive metabolism, TG are well cleared, TG-rich lipoproteins don't linger, large LDL-P are better cleared by endogenous (or statin-stimulated) LDLR, and large HDL-P function well



Insulin Resistance Changes Everything

Impaired TG clearance drives atherogenic dyslipidemia

↓TG, ↑HDL-c, ↓Small LDL-P



Sometimes, Insulin Resistance Can Be Physiologic

A temporary mechanism to conserve energy in times of need – *insulin levels stay low to release glucose, TG & HDL-c are normal*

Some "right times" to store away a little ectopic fat for quick release

1) Puberty
2) Pregnancy
3) Acute illness and/or other stressors
4) Fasting

In chronic overdrive insulin resistance = metabolic syndrome

In Peds, MetS = Central Adiposity & "Lipid Spillover"

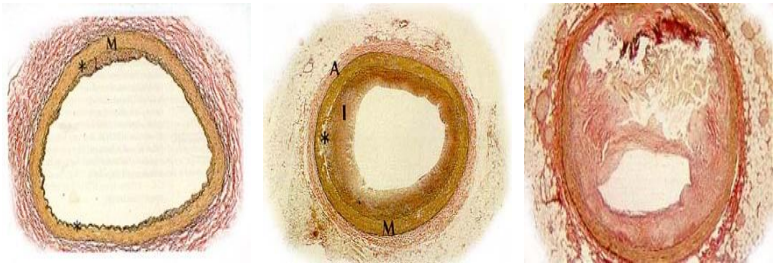
MetS dx =3 of 5:

↑ **WC**



Central weight distribution
Waist to Height Ratio > 0.5
As or more sensitive than BMI for risk prediction

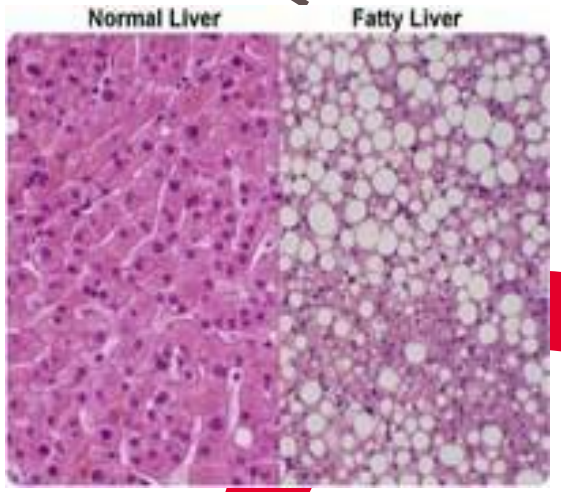
↑ **TG**
↓ **HDL-c**



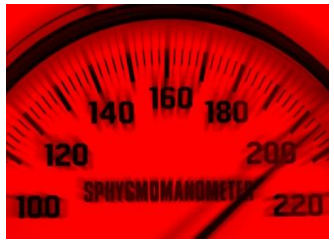
Dyslipidemia ↑TG ↓HDL
First Pediatric Predictor of Adult ASCVD
Morrison, Princeton LRC F/U Study , 2012
(+/- ↑ LDL-c)

3-4 decades of CVD risk

MAFLD



↑ **BP**



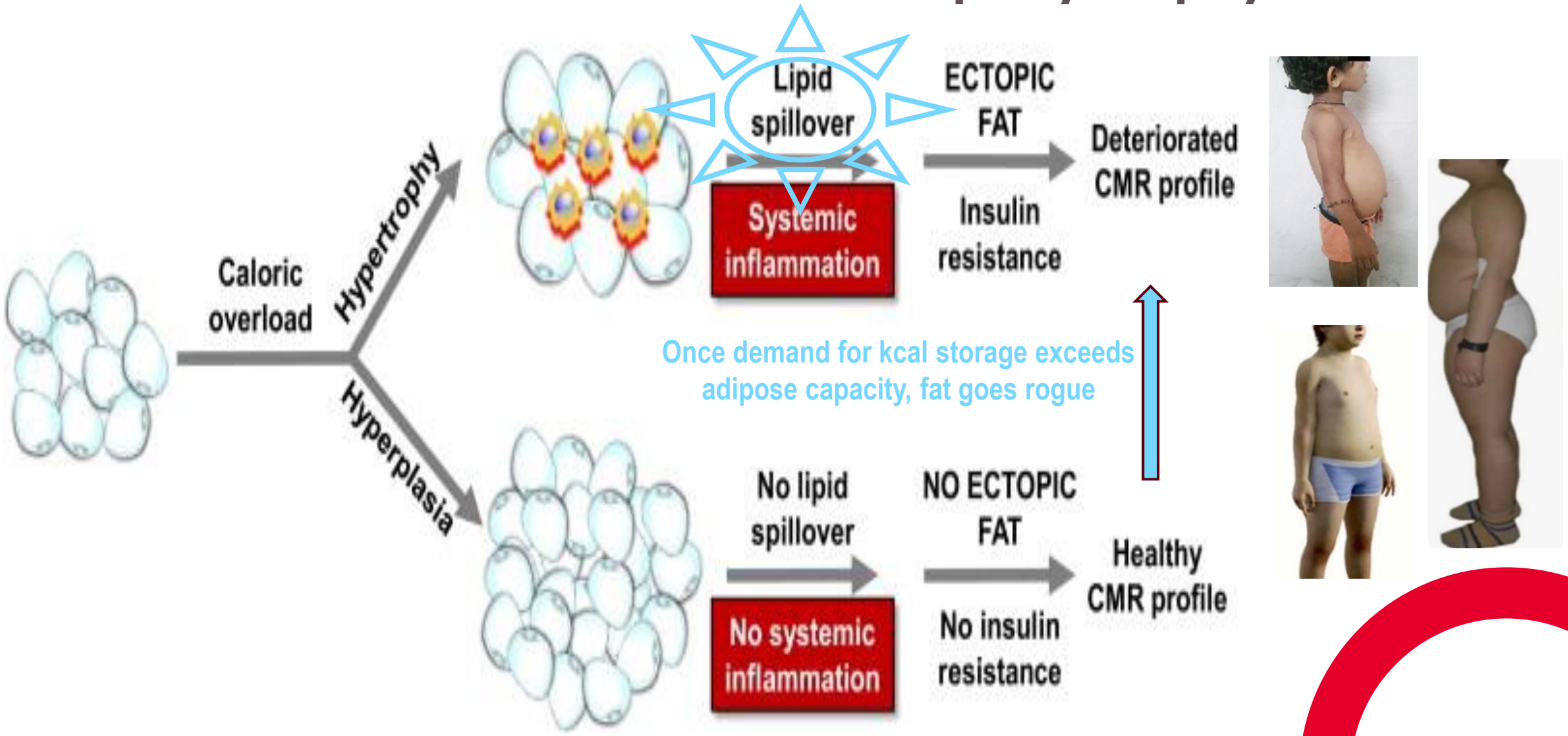
Hypertension
Often silent

↑ **Glc**



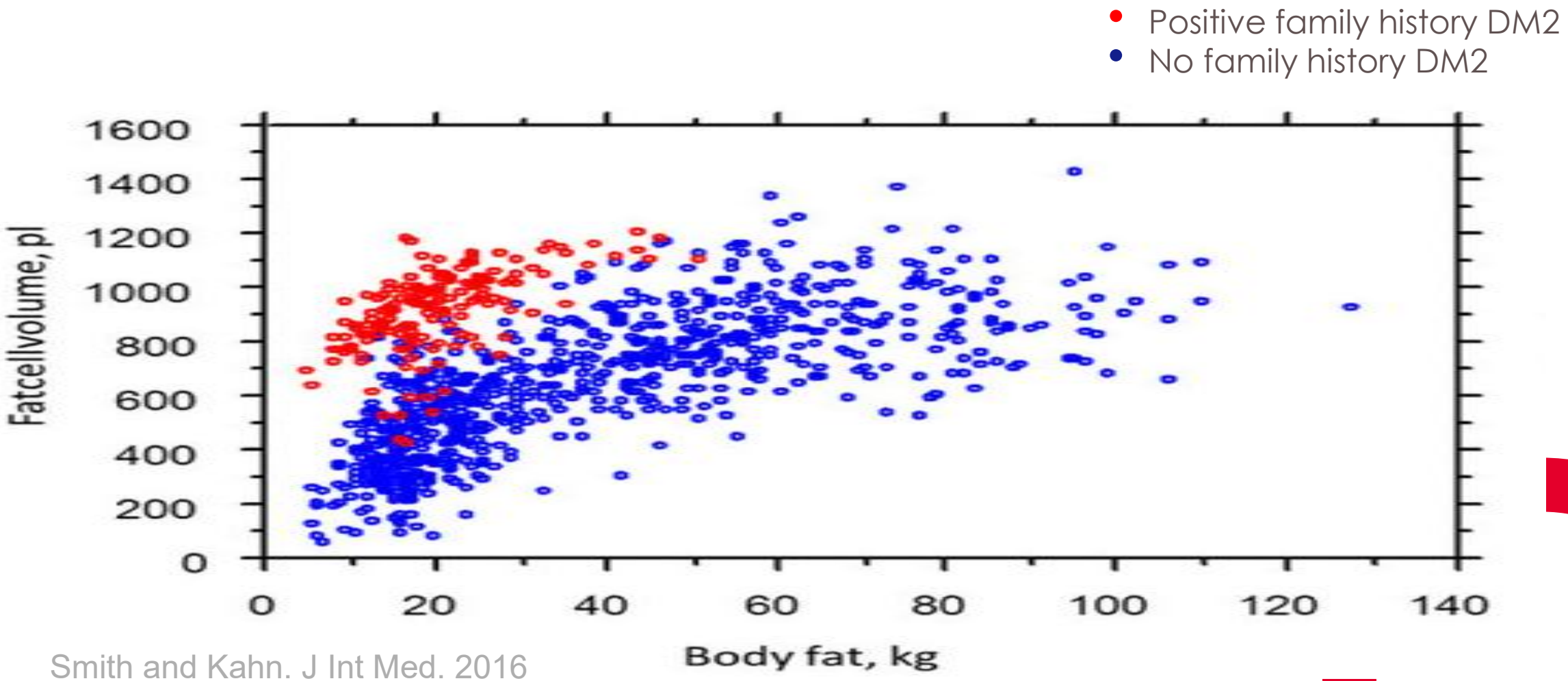
Hyperinsulinism
More common than hyperglycemia in youth

Cardiometabolic Risk, an Effective Lipodystrophy



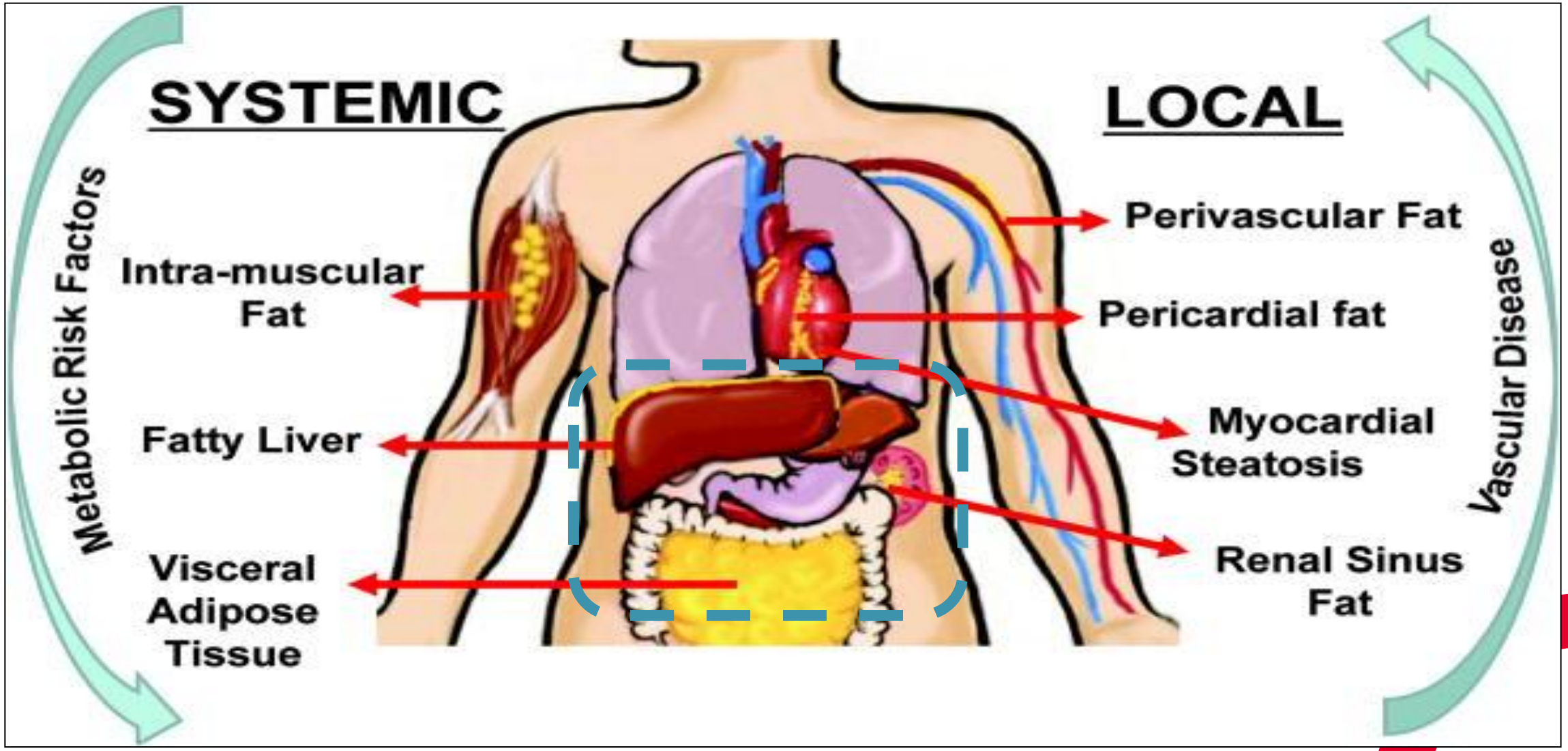
Normal Subq Adipose Tissue Overridden Sooner in Some

- 419 young adults at range of BMIs, 166 with family history DM2, had fat bx
- Pos Fm Hx DM2 - impaired Subq adipogenesis *at lower total body fat*



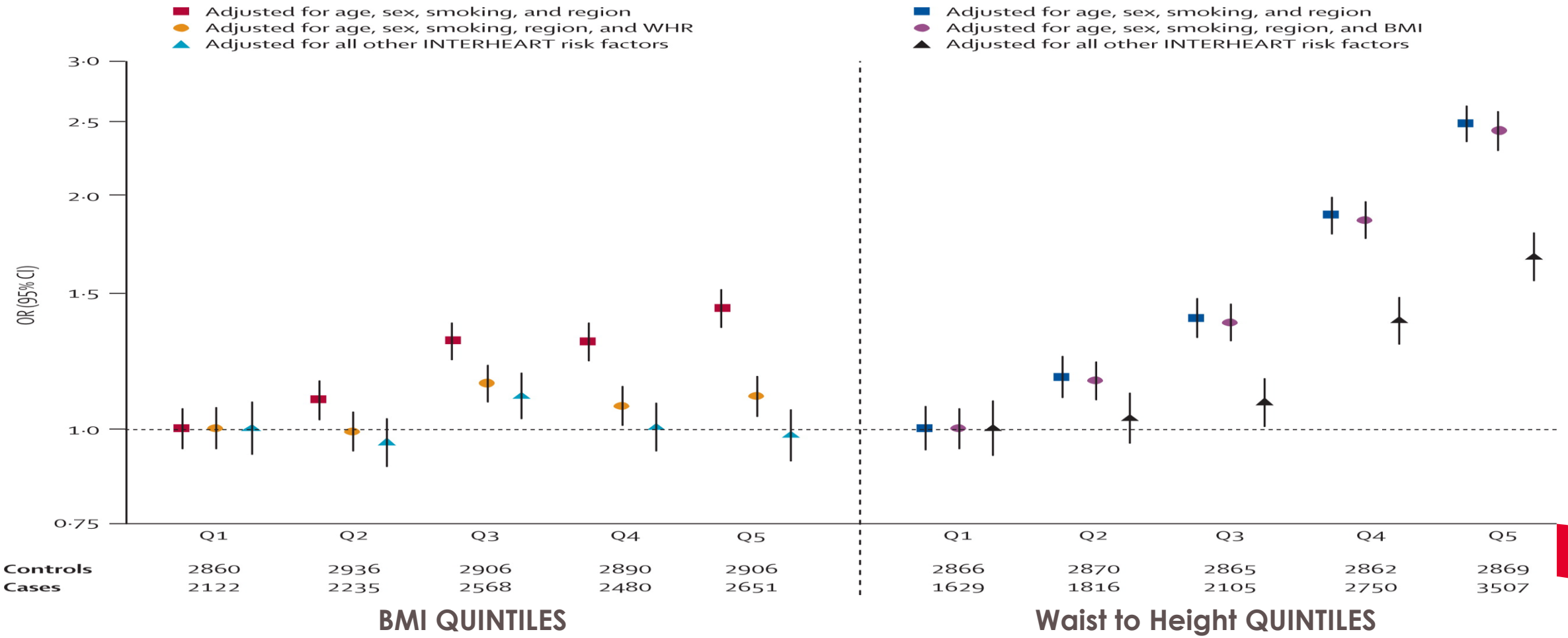
Smith and Kahn. J Int Med. 2016

Location, Location, Location



Weight Distribution a Stronger CVD Predictor Than BMI

INTERHEART 52-country case-control study-27,0000 adult participants



Yusef et al. Lancet 2004;366;1640-49

INTERHEART, 2004 Identified ~AHA 2022 Life's Essential 8



1) Dietary Quality HEI or MEPA-10 (Healthy Eating Index or Mediterranean Eating Pattern for Americans)
2) Active Minutes per week
3) HbA1c
4) **BMI** - *INTERHEART used WC*
5) **nonHDL-cholesterol**
   - *INTERHEART used apoB/apoAI*

Predictors of Insulin Resistance & small LDL-P

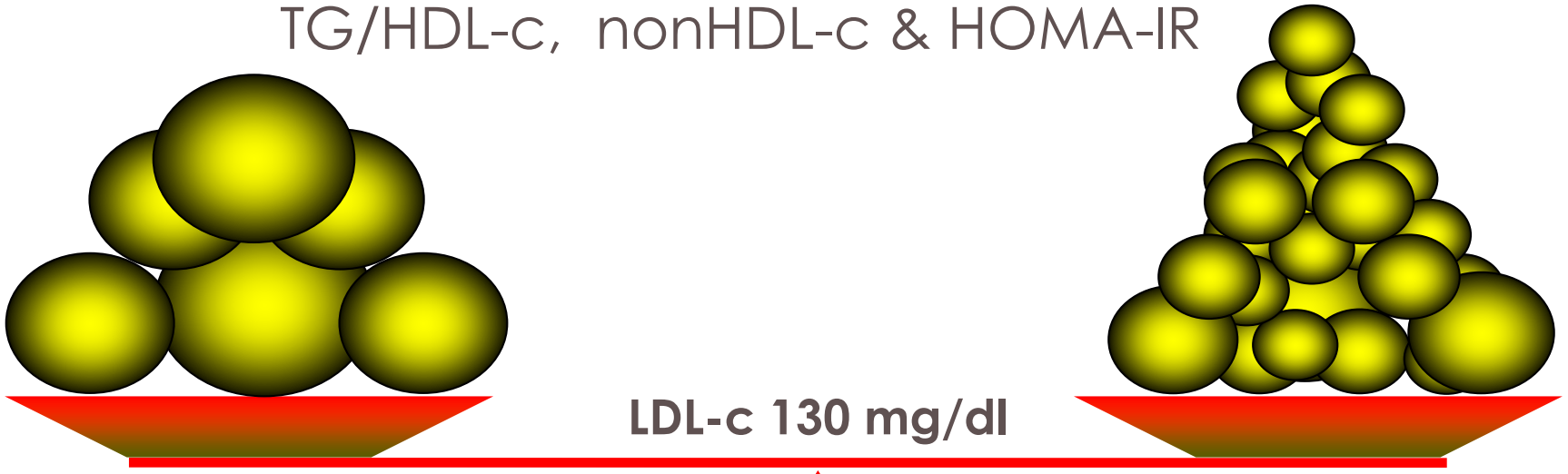
6) Blood Pressure
7) Smoking exposure
8) Average hours of sleep

Lloyd-Jones et al. Circulation. 2022;146:e18

Multivariate Model for LDL-P in 2384 6th graders

2/3 of LDL-P variation predicted by waist circumference,

TG/HDL-c, nonHDL-c & HOMA-IR



LDL-c 130 mg/dl

TG/HDL-c > 2.5
(> 2.0 in F & AA M)





WC:Ht > 0.5

HEALTHY Mietus-Snyder et al, *J Peds. 2013;163:355*

Insulin Sensitizing, α-inflammatory Diet *↓TG, ↑HDL-c & ↓smLDL*





CHO Upgrades

Avoid SSB (aka fast sugar)
Counsel teens to avoid ETOH!
Increase Fiber Intake = low GI
- *more veggies & whole fruits*
- *more whole grains*

PROTEIN Upgrades

More cold water fish intake
- more omega 3 PUFA

Aim for unprocessed meats
Think "Flexitarian"
- more plant protein

Some eggs (1-2/d) are OK



FAT Upgrades

Avoid Trans Fats
Limit Saturated Fats (8-10%)
Favor MUFA & PUFA
Increase esp. omega 3 PUFA
- *more fish*
- *walnuts, flax & chia seeds*





PLUS ONE HOUR MVPA/day!



Nutraceutical Therapy for TG Lowering

Omega 3 Fatty Acid Marine Fish Oil Supplements

- Lovaza ($$) – or OTC preps with 90% bioactive DHA + EPA
- 2 gm/d is TG lowering
  - *Cumulative with dietary sources*
  - *one oz of salmon ~ one gel cap*
  - For vegans: omega 3's can be algal sourced

- Typical US diet is >15:1 omega 6:omega 3 ( < 3:1)
- Most OTC preparations only 25-40% bioactive omega 3

Fish intake in meta-analysis associated with ↓ CVD;
mixed results for omega 3 alone

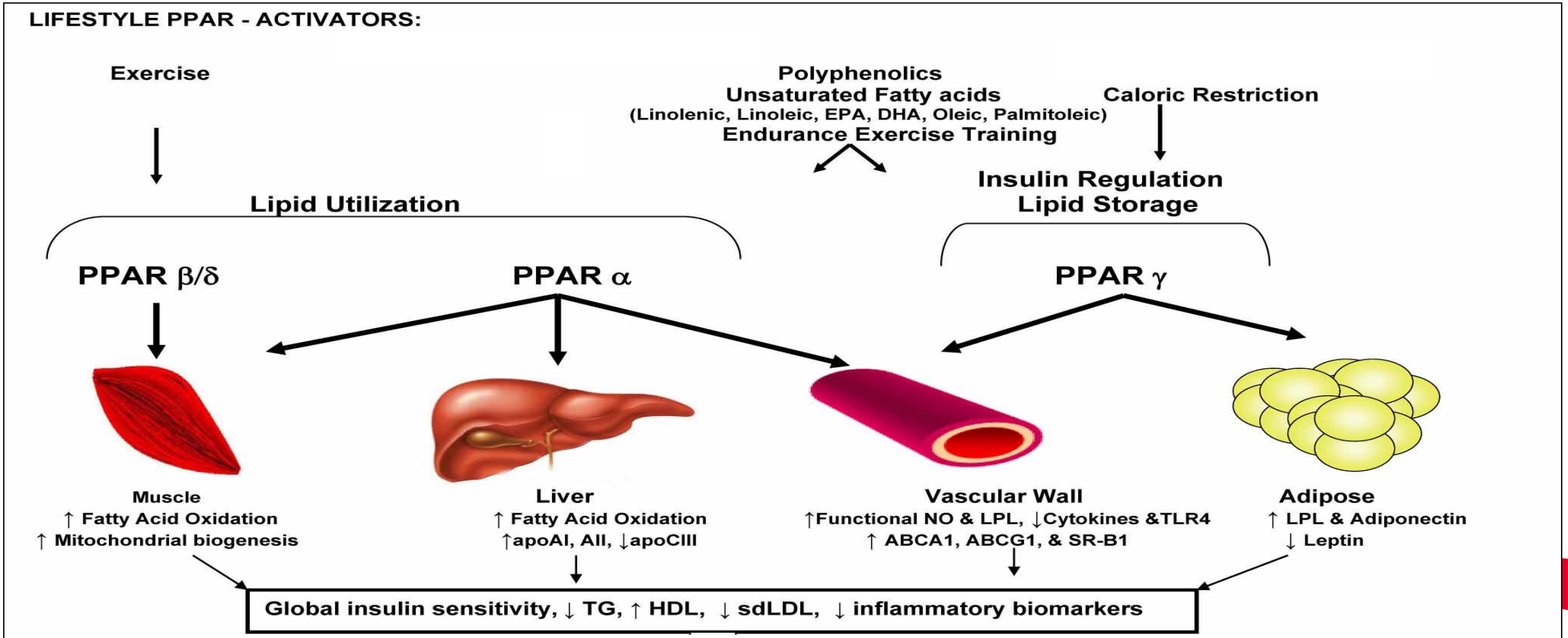
Bhatt, NEJM. 2019: DOI: 10.1056/NEJMoa1812792

Adjunct Meds for TG Lowering

- Fibric Acid Derivatives = Fenofibrate *Potent PPARα agonist* *
  - ↓ ↓ TG, ↑ HDL-c, and ↓ small LDL-P
  - Lowest dosage (48 mg Fenofibrate) q d is generally adequate
  - Similar hepatic and muscular risks as seen with statins
  - USE IS OFF LABEL IN PEDS
- Insulin sensitizing therapies
  - Metformin, GLP-1 agonists *
- NEW Antisense Oligonucleotide (ASO) targeting apoCIII
  - apoCIII is increased on TG-rich lipoproteins that linger with insulin resistance
  - Olezarsen – FDA approved for adults, pedi trials underway

** GLP-1 agonists are in crosstalk with ubiquitous PPAR pathways, esp PPARγ*

*An Insulin-Sensitizing Lifestyle is also PPAR-activating



When Adjunct LDL-c Lowering Meds are Indicated

Pediatrics 2011 Dec;128 Suppl 5:S213-56

PEDIATRIC THRESHOLDS	ACCEPTABLE < 75th HDL-c > 50th	BORDERLINE 75th-95th HDL-c 10th-50th	ABNORMAL > 95th HDL-c < 10th
TC	<170	170–199	≥200
LDL-c	<110	110–129	≥130*
Non-HDL-c	<120	120–144	≥145
TG	0–9y: <75 10–19y: <90	75–99 90–129	≥100 ≥130
HDL-c	>45 M >50 F	40–45	<40

***PEDI LDL-c PharmaThresholds**

~99th %ile

≥ 190 = FH

or

≥ 160 + risk

(1 HIGH or 2 MOD)

or

≥130 + + risk

(2 HIGH or 1 HIGH & 2 MOD)

LDL-c <95th %ile for children in general, <75th %ile in youth with diabetes

Target TG for all < 75th %ile

2011 Lipid Screening Guidelines Consider Cardiometabolic Risk

factors that predict more atherogenic smLDL

Criteria	Moderate Risk	High Risk = + Fm Hx CVD [ASVD in Parent or Grandparent Men < 55 yr; Women <65 yr]
BMI	>95th < 97th percentile	≥ 97% percentile
Hypertension	HBP w/o RX	HBP (>99% + 5 mm Hg) w/ RX
Cigarette smoking	-----	Current smoker
HDL-C	< 40 mg/dl	-----
Inflammatory medical conditions	Kawasaki disease w/ regressed coronary artery aneurysms	KD with current aneurysms
	Chronic inflammatory disease (JRA, SLE)	Type 1 and 2 DM
	HIV	Post orthotopic Heart Tx
	Nephrotic Syndrome	CKD/post renal transplant

Pediatrics 2011 Dec;128 Suppl 5:S213-56

Consequences of a Lifetime of Cardiometabolic Risk

Manifest after 3-4 decades

UKPDS Models estimate by the time glucose and HbA1c begin rising ~50% of pancreatic beta-cell function has been lost

- Incidence of heart attack, stroke, and cancer - all rising fastest in young adults
  - The proportion of 40-50 yo in the US having heart attack (MI) has increased 2% per yr over past decade
  - Strokes have risen 48% in 25-34 yo; 28% in 35-44 yo in the same 10 yrs
  - And colorectal cancers (also assoc. with insulin resistance) are increasing fastest in persons < 50 yr, projected to rise by 90% in 15-34 yo by 2030

Yang J. ACC 2019, Results from YOUNG-MI Registry
Li L. JAMA 2022;328:563-574

Ideally, Management of Insulin Resistance Begins Early

Referral to Preventive Cardiology:

Patients with any of the following on fasting lipid profile:

- Total cholesterol > 200mg/dL
- LDL > 130 mg/dL
- Triglycerides > 250 mg/dL
- Triglycerides/HDL >2.5 &/or non-HDL >145mg/dL (ie ↑smLDLP)

Or families who don't cross these thresholds but are concerned due to FHx & interested in more support

SUMMARY

- Lipid has critical functions, trafficked by lipoproteins
- Kcal lipid storage demand > adipose capacity is toxic
  - Central adiposity (WHtR > 0.5)
- Combined hyper- or dys- lipidemia is an early 

for pathologic insulin resistance
  - TG/HDL-c > 2.5
  - LDL-cholesterol may be unremarkable, *but small LDL & total LDLP ↑*
- Insulin sensitizing lifestyle habits = first and forever therapy
- Adjunct Rx – omega 3's, PPAR activators, insulin sensitizers and new apoCIII inhibitors – all may help



Children's National®

Continuing Education – Learner Notification

Two Decades of Progress: Advancing Pediatric Obesity Care
September 18th, 2026

Notice of Requirement for Successful Completion

Participants may earn CE credit for this activity by attending the entire education session and completing the required evaluation. Instructions for claiming CE credit, including the attendance code, will be provided at the conclusion of the activity.

Nurses: Children's National Hospital designates this live activity for a maximum of 5.0 ANCC contact hours for nurses. Nurses should claim only the credit commensurate with the extent of their participation in the activity.

Physicians: Children's National Hospital designates this live activity for a maximum of 5.0 AMA PRA Category 1 Credits™ for physicians. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Pharmacists: Children's National Hospital is accredited by the Accreditation Council for Pharmacy Education (ACPE) as a provider of continuing pharmacy education. This program meets ACPE criteria for 5.0 contact hours.

Psychologists: Continuing Education (CE) credits for psychologists are provided through the co-sponsorship of the American Psychological Association (APA) Office of Continuing Education in Psychology (CEP). The APA CEP Office maintains responsibility for the content of the programs. Children's National Hospital designates this live activity for a maximum of 5.0 CE credits (Instructional Level: Intermediate Learning).

IPCE: This activity was planned by and for the healthcare team, and learners will receive 5.0 Interprofessional Continuing Education (IPCE) credit for learning and change.

Relevant Financial Relationships

The planning committee and presenters have no relevant financial relationships with ineligible companies.

Financial and In-Kind Commercial Support

No financial nor in-kind commercial support was received for this education activity.

JOINTLY ACCREDITED PROVIDER™ INTERPROFESSIONAL CONTINUING EDUCATION

In support of improving patient care, Children's National Hospital is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team. Children's National Hospital Accreditation Provider# 4008362.

The Skinny on Obesity Related Hypertension in Children

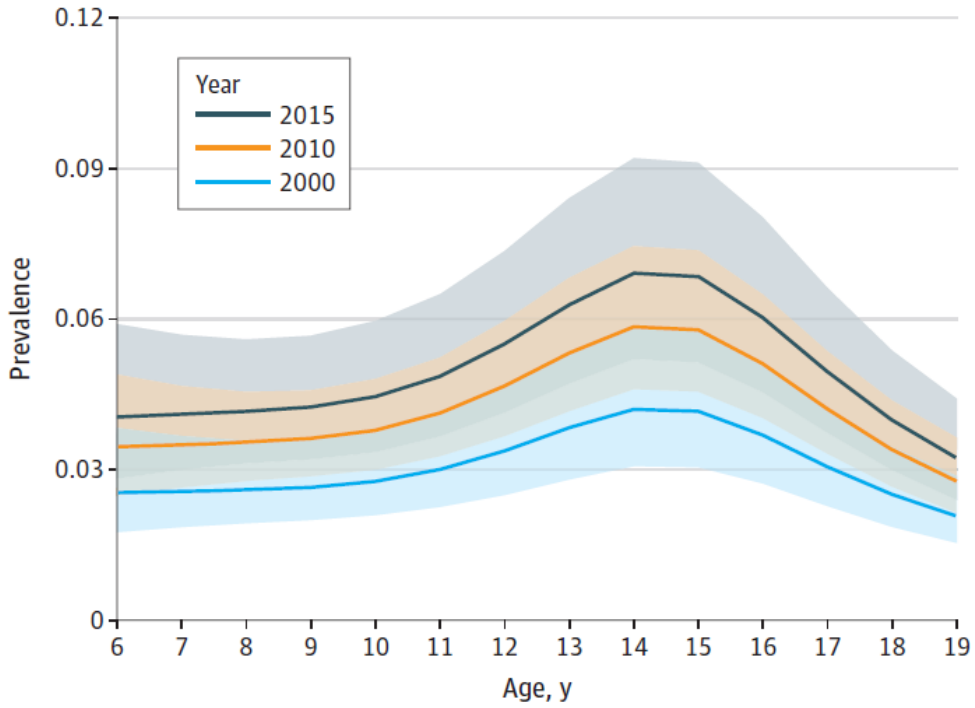
Tammy M. Brady, MD, PhD
Director, Hypertension and Kidney Health Research
Medical Director, Hypertension Detection and Treatment Program
Professor of Pediatrics



Children's National®

Epidemiology of Pediatric Hypertension - Worldwide

Figure 2. Age-Specific Prevalence of Childhood Hypertension in 2000, 2010, and 2015



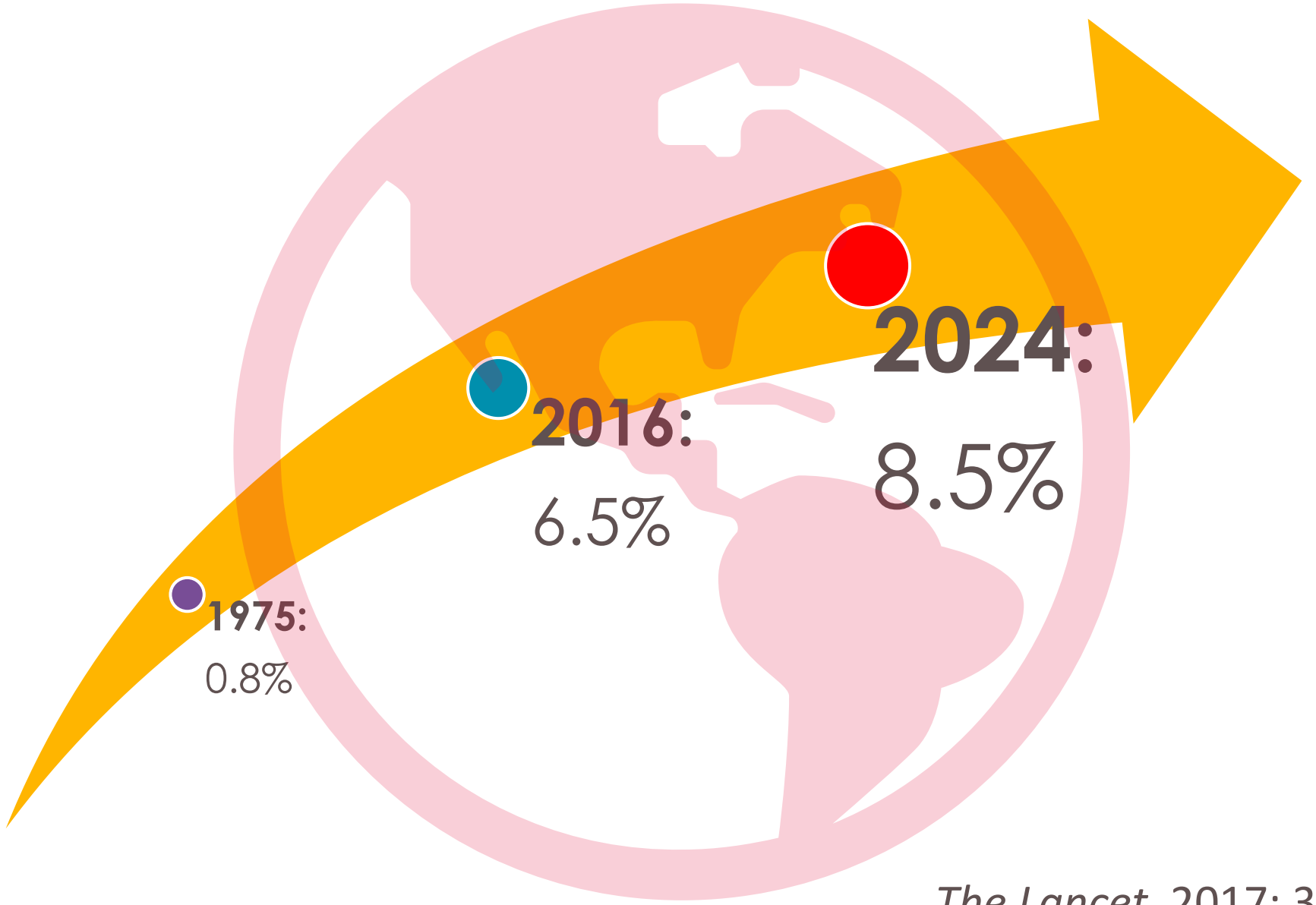
Childhood hypertension was based on blood pressure measured by mercury sphygmomanometer. Shaded areas indicate 95% CIs.

Song et al, *JAMA Pediatr*. 2019;173(12):1154-1163

Relative increase of 75-79%!

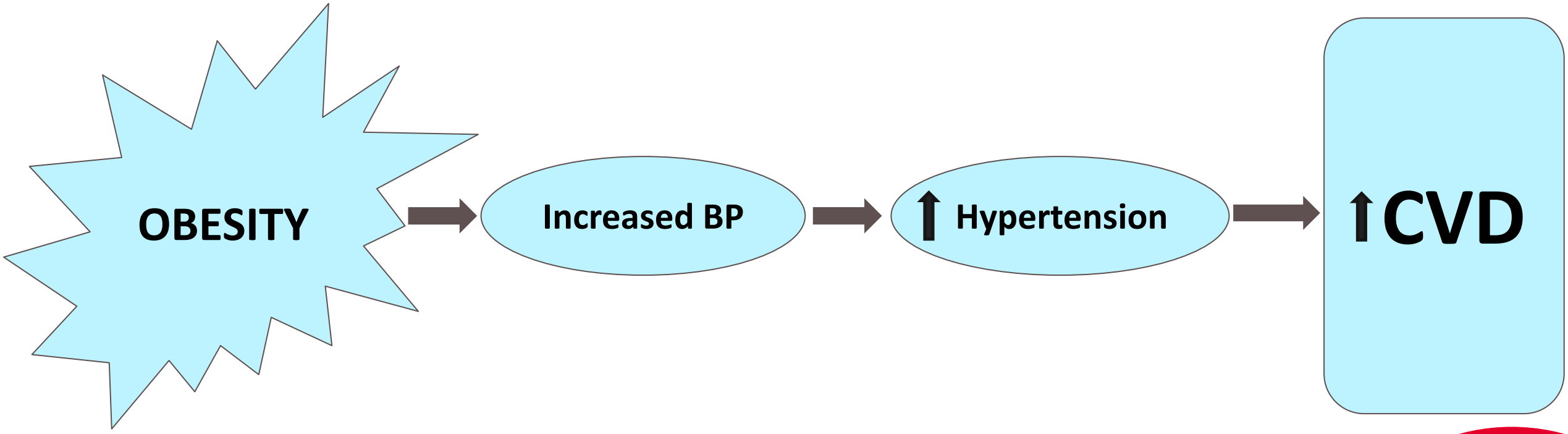


Global Prevalence of Pediatric Obesity



The Lancet. 2017; 390: 2627-2642.

JAMA Pediatr. 2024;178(8):800-813.



Children's National

TABLE 3. BP Levels for Boys by Age and Height Percentile

Age, y	BP Percentile	SBP, mm Hg							DBP, mm Hg						
		Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
1	50th	80	81	83	85	87	88	89	34	35	36	37	38	39	39
	90th	94	95	97	99	100	102	103	49	50	51	52	53	53	54
	95th	98	99	101	103	104	106	106	54	54	55	56	57	58	58
	99th	105	106	108	110	112	113	114	61	62	63	64	65	66	66
2	50th	84	85	87	88	90	92	92	39	40	41	42	43	44	44
	90th	97	99	100	102	104	105	106	54	55	56	57	58	58	59
	95th	101	102	104	106	108	109	110	59	59	60	61	62	63	63
	99th	109	110	111	113	115	117	117	66	67	68	69	70	71	71
3	50th	86	87	89	91	93	94	95	44	44	45	46	47	48	48
	90th	100	101	103	105	107	108	109	59	59	60	61	62	63	63
	95th	104	105	107	109	110	112	113	63	63	64	65	66	67	67
	99th	111	112	114	116	118	119	120	71	71	72	73	74	75	75
4	50th	88	89	91	93	95	96	97	47	48	49	50	51	51	52
	90th	102	103	105	107	109	110	111	62	63	64	65	66	66	67
	95th	106	107	109	111	112	114	115	66	67	68	69	70	71	71
	99th	113	114	116	118	120	121	122	74	75	76	77	78	78	79
5	50th	90	91	93	95	96	98	98	50	51	52	53	54	55	55
	90th	104	105	106	108	110	111	112	65	66	67	68	69	69	70
	95th	108	109	110	112	114	115	116	69	70	71	72	73	74	74
	99th	115	116	118	120	121	123	123	77	78	79	80	81	81	82
6	50th	91	92	94	96	98	99	100	53	53	54	55	56	57	57
	90th	105	106	108	110	111	113	113	68	68	69	70	71	72	72
	95th	109	110	112	114	115	117	117	72	72	73	74	75	76	76
	99th	116	117	119	121	123	124	125	80	80	81	82	83	84	84
7	50th	92	94	95	97	99	100	101	55	55	56	57	58	59	59
	90th	106	107	109	111	113	114	115	70	70	71	72	73	74	74
	95th	110	111	113	115	117	118	119	74	74	75	76	77	78	78
	99th	117	118	120	122	124	125	126	82	82	83	84	85	86	86
8	50th	94	95	97	99	100	102	102	56	57	58	59	60	60	61
	90th	107	109	110	112	114	115	116	71	72	72	73	74	75	76
	95th	111	112	114	116	118	119	120	75	76	77	78	79	79	80
	99th	119	120	122	123	125	127	127	83	84	85	86	87	87	88
9	50th	95	96	98	100	102	103	104	57	58	59	60	61	61	62
	90th	109	110	112	114	115	117	118	72	73	74	75	76	76	77
	95th	113	114	116	118	119	121	121	76	77	78	79	80	81	81
	99th	120	121	123	125	127	128	129	84	85	86	87	88	88	89
10	50th	97	98	100	102	103	105	106	58	59	60	61	61	62	63
	90th	111	112	114	115	117	119	119	73	73	74	75	76	77	78
	95th	115	116	117	119	121	122	123	77	78	79	80	81	81	82
	99th	122	123	125	127	128	130	130	85	86	86	88	88	89	90
11	50th	99	100	102	104	105	107	107	59	59	60	61	62	63	63
	90th	113	114	115	117	119	120	121	74	74	75	76	77	78	78
	95th	117	118	119	121	123	124	125	78	78	79	80	81	82	82
	99th	124	125	127	129	130	132	132	86	86	87	88	89	90	90
12	50th	101	102	104	106	108	109	110	59	60	61	62	63	63	64
	90th	115	116	118	120	121	123	123	74	75	75	76	77	78	79
	95th	119	120	122	123	125	127	127	78	79	80	81	82	82	83
	99th	126	127	129	131	133	134	135	86	87	88	89	90	90	91
13	50th	104	105	106	108	110	111	112	60	60	61	62	63	64	64
	90th	117	118	120	122	124	125	126	75	75	76	77	78	79	79
	95th	121	122	124	126	128	129	130	79	79	80	81	82	83	83
	99th	128	130	131	133	135	136	137	87	87	88	89	90	91	91
14	50th	106	107	109	111	113	114	115	60	61	62	63	64	65	65
	90th	120	121	123	125	126	128	128	75	76	77	78	79	79	80
	95th	124	125	127	128	130	132	132	80	80	81	82	83	84	84
	99th	131	132	134	136	138	139	140	87	88	89	90	91	92	92
15	50th	109	110	112	113	115	117	117	61	62	63	64	65	66	66
	90th	122	124	125	127	129	130	131	76	77	78	79	80	80	81
	95th	126	127	129	131	133	134	135	81	81	82	83	84	85	85
	99th	134	135	136	138	140	142	142	88	89	90	91	92	93	93
16	50th	111	112	114	116	118	119	120	63	63	64	65	66	67	67
	90th	125	126	128	130	131	133	134	78	78	79	80	81	82	82
	95th	129	130	132	134	135	137	137	82	83	83	84	85	86	87
	99th	136	137	139	141	143	144	145	90	90	91	92	93	94	94
17	50th	114	115	116	118	120	121	122	65	66	66	67	68	69	70
	90th	127	128	130	132	134	135	136	80	80	81	82	83	84	84
	95th	131	132	134	136	138	139	140	84	85	86	87	87	88	89
	99th	139	140	141	143	145	146	147	92	93	93	94	95	96	97

- Normative BP values in the 2004 Fourth Report

PEDIATRICS Vol. 114 No. 2 August 2004

Impact of Overweight/Obesity on BP norms

- Normative values in 2004 had been based on data from 63,227 U.S. children seen at 83,091 physician visits over the course of 11 studies
- Includes normal weight, overweight, obese

APPENDIX A. Demographic Data on Height/Blood Pressure Distribution Curves by Study Population

Source	Age, y	Gender		Ethnic Group							Persons *Visits* SBP Available	Persons *Visits* DBP.5 Available	Total No. of Persons *Visits*
		Male	Female	Black	Hispanic	White	Asian	Native American	Other	Missing			
National Institutes of Health	6–17	1896	1751	600	0	2963	0	0	84	0	3647	3609	3647
											3647	*3609*	*3647*
Pittsburgh	1–5	148	137	108	0	176	0	0	0	1	285	0	285
											893	*0*	*893*
Dallas	13–17	5916	5649	5266	1570	4729	0	0	0	0	11 565	11 565	11 565
											21 860	*21 852*	*21 860*
Bogalusa	1–17	3751	3607	2480	0	4878	0	0	0	0	7358	0	7358
											15 882	*0*	*15 882*
Houston	3–17	1457	1377	637	1341	748	23	0	0	85	2834	0	2834
											2834	*0*	*2834*
South Carolina	4–17	3167	3263	3110	0	3320	0	0	0	0	6430	6368	6430
											6430	*6368*	*6430*
Iowa	5–17	2099	1993	0	0	4092	0	0	0	0	4092	0	4092
											4092	*0*	*4092*
Providence	1–3	230	231	24	4	431	0	0	2	0	461	371	461
											898	*560*	*898*
Minnesota	9–17	9991	9418	3422	555	11 311	1677	644	1800	0	19 409	19 207	19 409
											19 409	*19 207*	*19 409*
NHANES III	5–17	2465	2577	1770	1830	1324	64	10	12	32	5042	4304	5042
											5042	*4304*	*5042*
NHANES 1999–2000	8–17	1041	1063	605	988	437	0	0	74	0	2104	2076	2104
											2104	*2076*	*2104*
Total (percent of total)	1–17	32 161 (51)	31 066 (49)	18 022 (29)	6288 (10)	34 409 (54)	1764 (3)	654 (1)	1972 (3)	118 (0)	63 227 *83 091*	47 500 *57 976*	63 227 *83 091*

Rosner et al. Am J Epidemiol 2008;167:653–666

Impact of Overweight/Obesity on BP norms

Source	Year	# 4th Report	# Normal BMI	% BMI >85%ile
NHANES II	1976-1980	3,647	3,001	18%
Pittsburgh	1975-1982	285	271	5%
Dallas	1976-1980	11,565	9,843	15%
Bogalusa	1973-1982	7,358	6,448	13%
Houston	1975-1978	2,834	2,276	20%
South Carolina	1982-1983	6,430	5,234	19%
Iowa	1981	4,092	3,146	23%
Providence	1985-1987	461	411	11%
Minnesota	1986-1987	19,409	14,579	25%
NHANES III	1988-1991	5,042	3,460	31%
NHANES 1999-2000	1999-2000	2,104	1,298	38%
Total:		**63,227**	**49,967**	**21%**

Normative BP Differences

	Height Percentile – 12 yr old Boy						
	5%	10%	25%	50%	75%	90%	95%
90th %ile SBP							
All Children* (4th Report Norms)	115	116	118	120	121	123	123
Normal Weight Norms**	113	114	115	117	119	121	122
90th %ile DBP							
All Children* (4th Report Norms)	74	75	75	76	77	78	79
Normal Weight Norms**	75	75	75	75	75	76	76

1-3 mmHg

0-3 mmHg

*Fourth Report: Pediatrics Vol 114, No. 2, August 2004

**Rosner, B et al, *American Journal of Epidemiology*, 2008.

Youth with Obesity have greater Incident Hypertension

TABLE 3 HRs and 95% CIs[a] for the Association Between Baseline BMI Category[b] and Incident HTN Over Median 3.1-y Follow-up

BMI Category[b]	Children 3–11 y				Adolescents 12–17 y			
	No. Cases Incident HTN	Person-Years Follow-Up	HR	95% CI	No. Cases Incident HTN	Person-Years Follow-Up	HR	95% CI
Low healthy wt	35	55 859	1.00 Reference		17	18 612	1.00 Reference	
High healthy wt	35	66 696	0.72	0.45–1.14	29	26 185	0.93	0.51–1.70
Overweight	35	27 012	1.42	0.88–2.27	26	11 745	1.41	0.76–2.62
Obese	44	17 926	2.02	1.28–3.18	47	8710	2.2	1.24–3.91
Severely obese	44	5833	4.42	2.77–7.04	31	2037	4.46	2.39–8.31
P for linear trend			<.0001				<.0001	

[a] Adjusted for gender, race, insurance type, year of cohort entry (secular trend), study site, annual visit rate, and baseline SBP percentile.

[b] BMI categories: Low healthy wt, 5th–49th percentile; high healthy wt, 50th–84th percentile; overweight, 85th–94th percentile; obese, 95th–99th percentile, severely obese, ≥99th percentile.

Parker, ED, et al. *Pediatrics*. 2016.

	N Incident HTN	*N*	Change in SBP	*P* for Difference Baseline to Follow-up
Healthy wt				
Stayed healthy wt	27	15 526	−4.0 (0.4)	<.0001
Healthy wt to overweight	11	2257	5.1 (0.7)	<.0001
Healthy wt to obese	0	19	12.8 (0.9)	<.0001
Healthy wt to severely obese	0	5	20.8 (1.6)	<.0001
Overweight				
Stayed overweight	7	2592	−3.4 (0.8)	.0086
Overweight to healthy wt	4	1705	−12.5 (0.6)	<.0001
Overweight to obese	7	658	4.3 (1.0)	<.0001
Overweight to severely obese	0	6	12.3 (1.7)	.0018
Obese				
Stayed obese	31	2458	−5.3 (1.0)	<.0001
Obese to healthy wt	0	185	−22.1 (0.6)	<.0001
Obese to overweight	9	1386	−13.0 (0.9)	.9968
Obese to severely obese	7	444	2.7 (1.7)	<.0001
Severely obese				
Stayed severely obese	25	733	−6.1 (2.0)	.2357
Severe obese to healthy wt	0	23	−30.9 (1.2)	<.0001
Severe obese to overweight	0	19	−21.8 (1.3)	<.0001
Severely obese to obese	4	251	−14.1 (1.4)	<.0001

Models adjusted for gender, race, insurance type, year of cohort entry (secular trend), study site, annual visit rate, and baseline SBP perc

Parker, ED, et al. *Pediatrics*. 2016.

Prevention and Treatment of Obesity Lowers Blood Pressure

Childhood Obesity is Associated with Adult CV Events

- **i3C consortium**
  - 42,324 participants enrolled at 3 to 19 yrs of age
    - United States
    - Australia
    - Finland

Table 3. Hazard Ratios for Adult Cardiovascular Events According to Clinical Categories of Childhood Risk-Factor

Risk Factor	Fatal or Nonfatal Cardiovascular Events		
	Participants	Participants with Event	Hazard Ratio (95% CI)†
	no./total no. (%)		
Youth smoking			
No	12,301/19,520 (63.0)	283/12,301 (2.3)	Reference
Yes	7,219/19,520 (37.0)	327/7,219 (4.5)	1.70 (1.49–1.93)
Body-mass index			
Low-normal	8,048/20,599 (39.1)	237/8,048 (2.9)	Reference
High-normal	8,688/20,599 (42.2)	280/8,688 (3.2)	1.19 (1.01–1.41)
Overweight	2,423/20,599 (11.8)	134/2,423 (5.5)	1.92 (1.62–2.27)
Obese	1,440/20,599 (7.0)	117/1,440 (8.1)	3.39 (2.73–4.21)

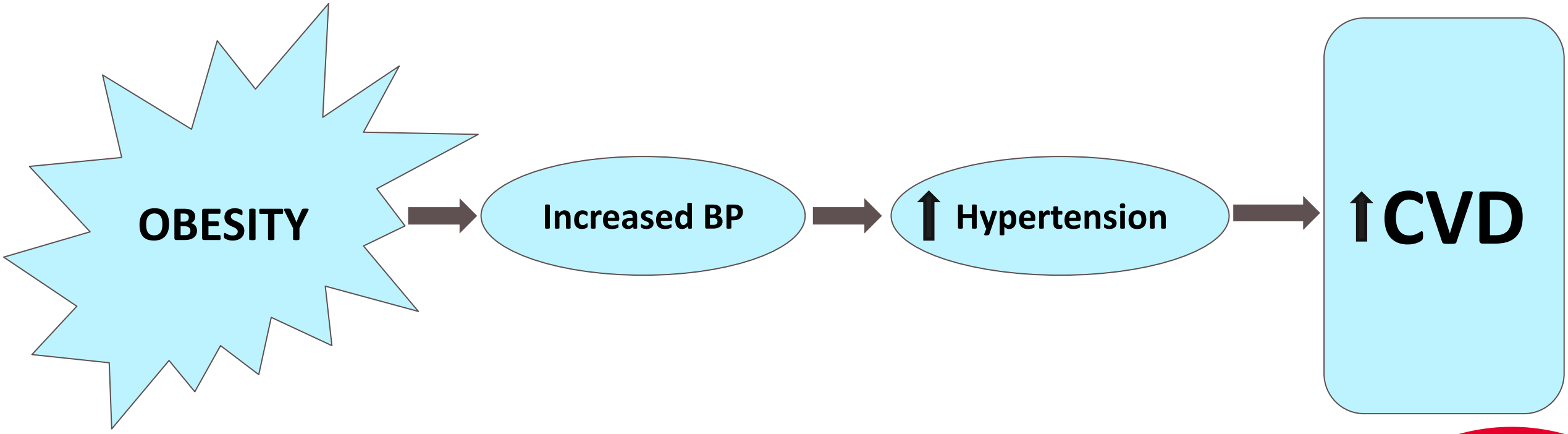
2016 (20-46 yrs later):

Fatal CV event?

Non-Fatal CV event?

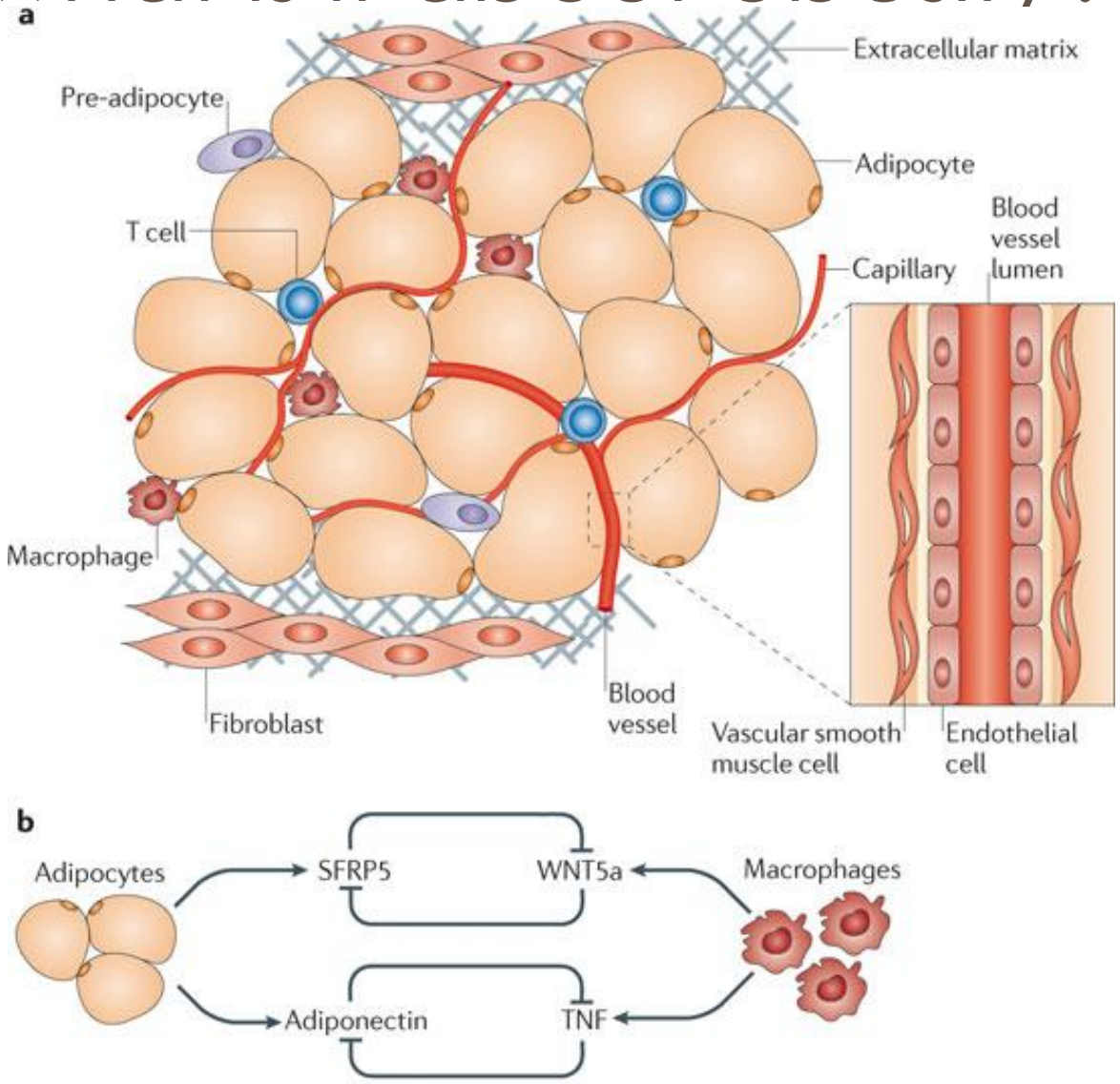
- MI
- CVA
- TIA
- Heart failure
- Angina
- PAD
- Carotid intervention
- AAA
- Coronary revascularization

Jacobs et al, N Engl J Med 2022;386:1877-88



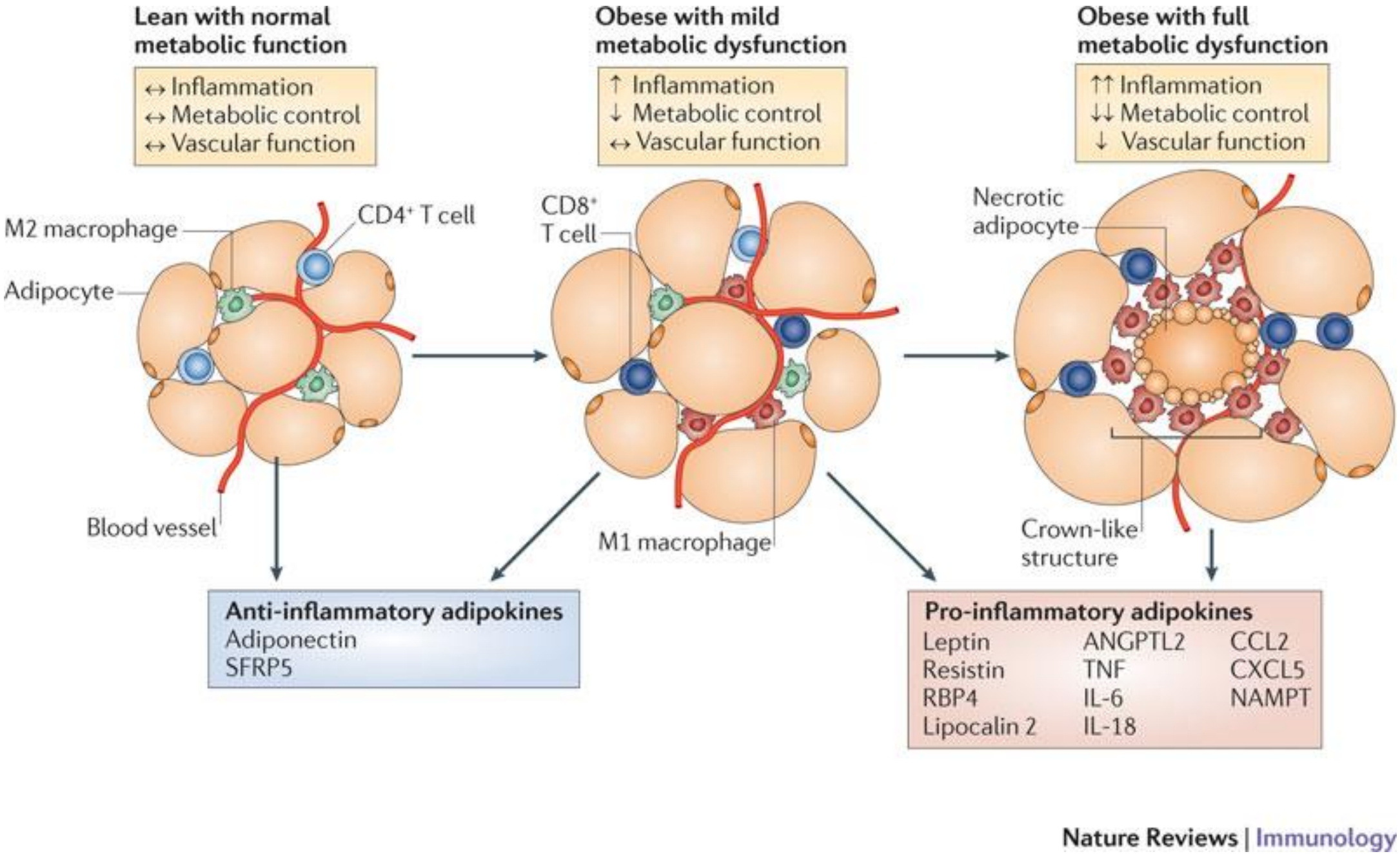
Children's National

So what is it about obesity??



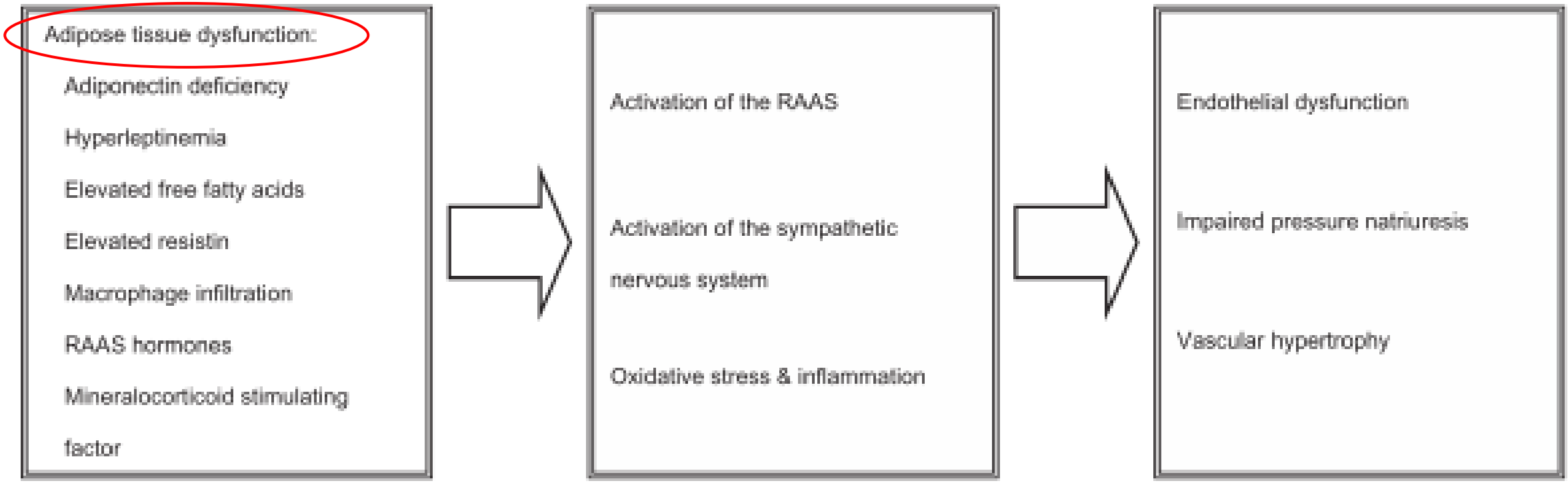
Nature Reviews | Immunology

Nature Reviews Immunology **11**, 85-97 (February 2011)

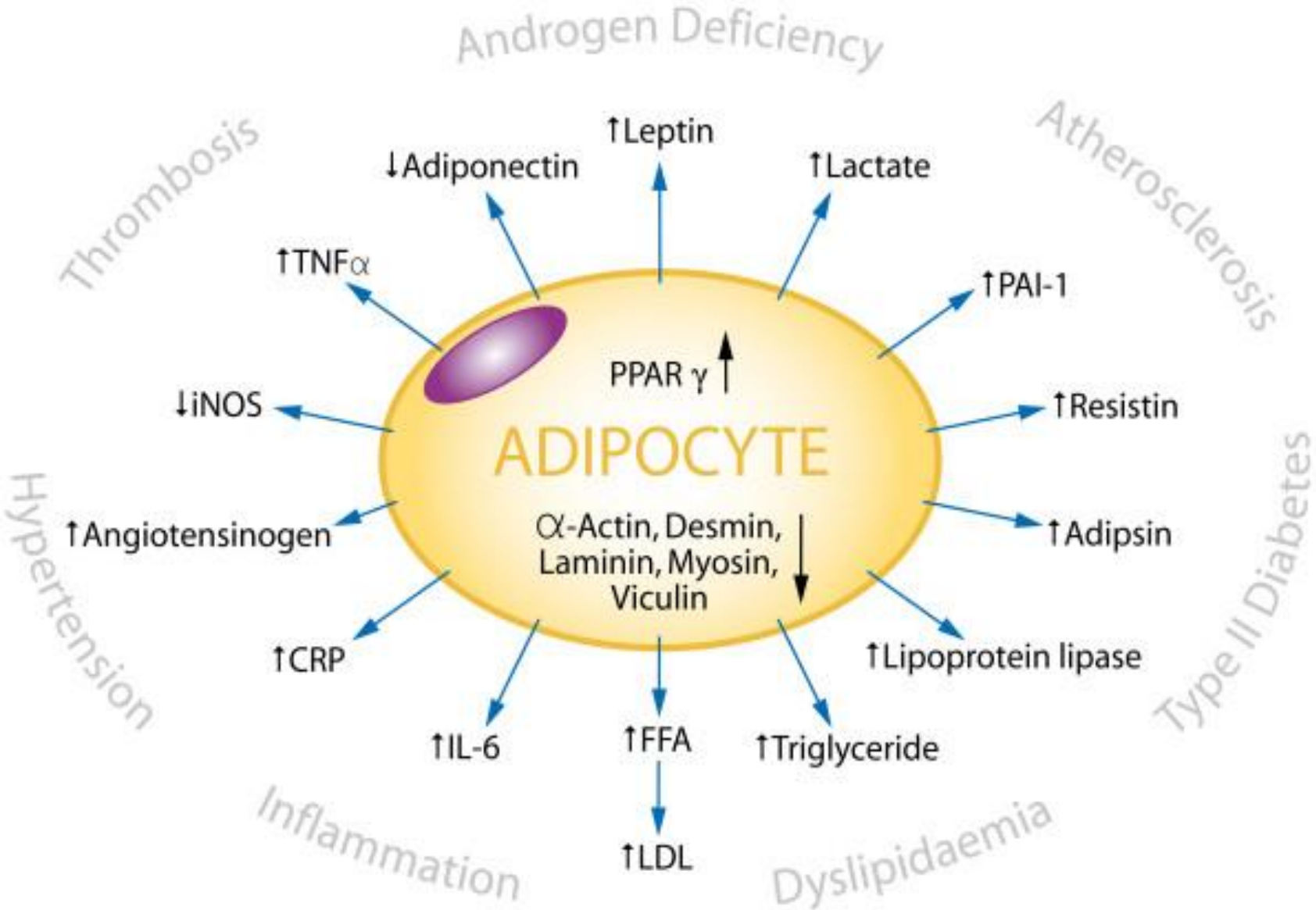


Nature Reviews Immunology **11**, 85-97 (February 2011)

Role of Obesity in Hypertension

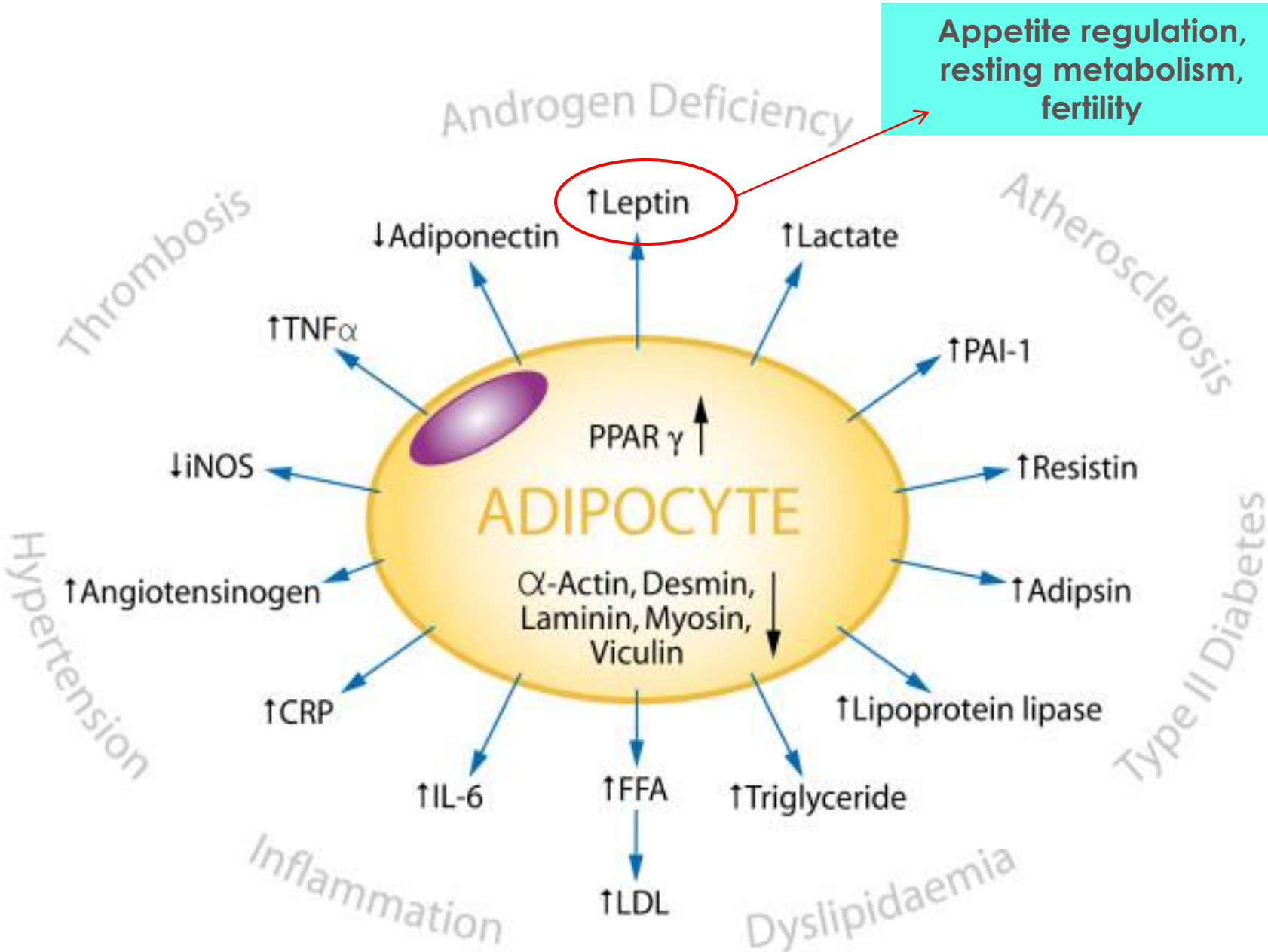


Dorresteijn et al, *Obesity Reviews*, 2012.



Carruthers, M et al, *Cardiovascular Diabetology*, 2008.

- Normal adipose tissue produces hormones and cytokines
  - Referred to as adipokines or adipocytokines
- Adipokines are proinflammatory proteins that are upregulated in obesity
- Upregulation in dysregulated adiopose tissue leads to the development of a chronic inflammatory state and contributes to metabolic dysfunction



Predominantly secreted by adipose tissue

Regulates feeding behavior via CNS

Increases SNS mediated energy expenditure

Regulates body weight

Levels correlate with adipose mass

Carruthers, M et al, *Cardiovascular Diabetology*, 2008.

Almost exclusively synthesized by adipocytes

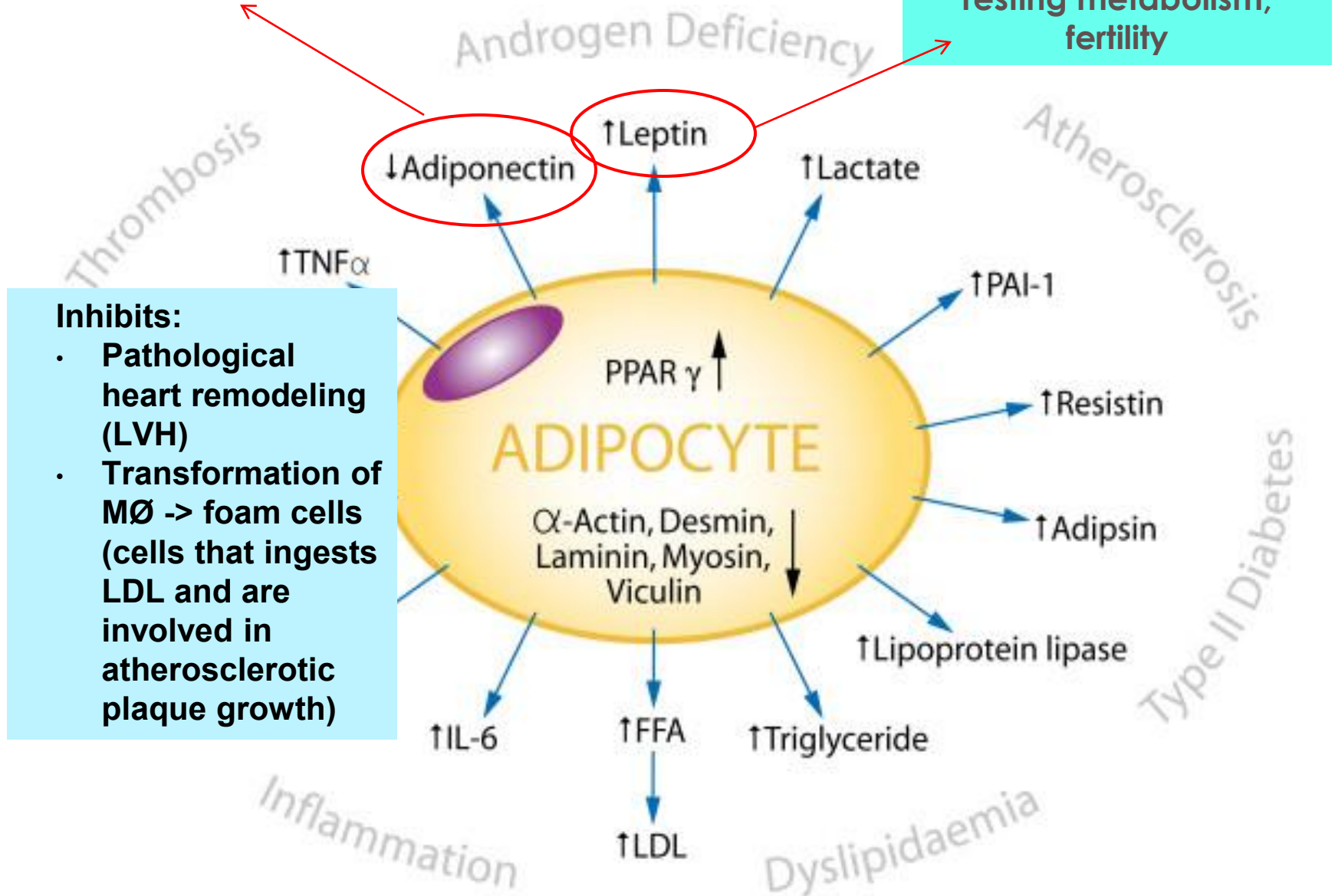
Decreased adiponectin contributes to insulin resistance

Reduces SNS conduction to kidney

Stimulates endothelial nitric oxide synthase (eNOS)

Glucose and lipid metabolism

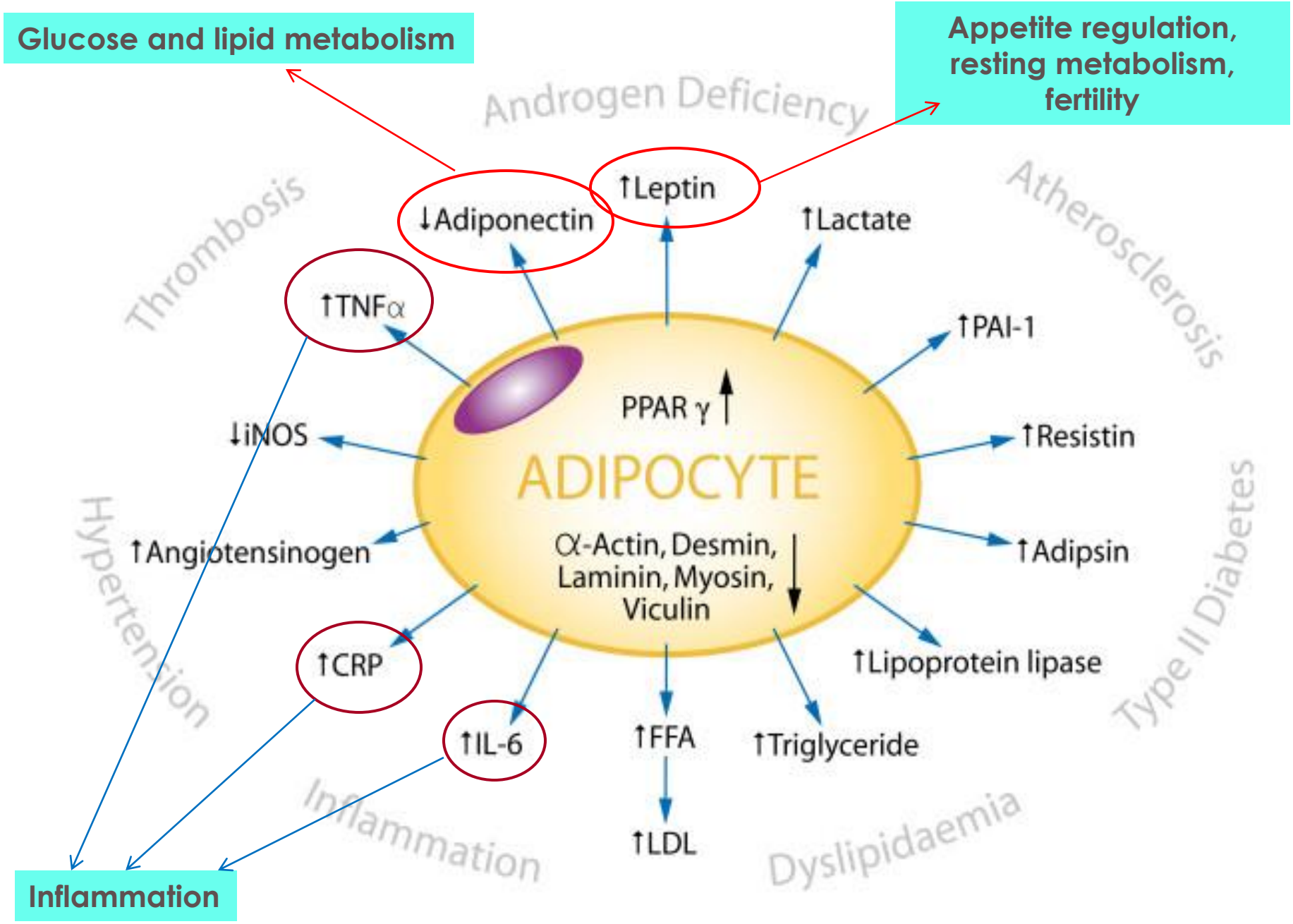
Appetite regulation, resting metabolism, fertility



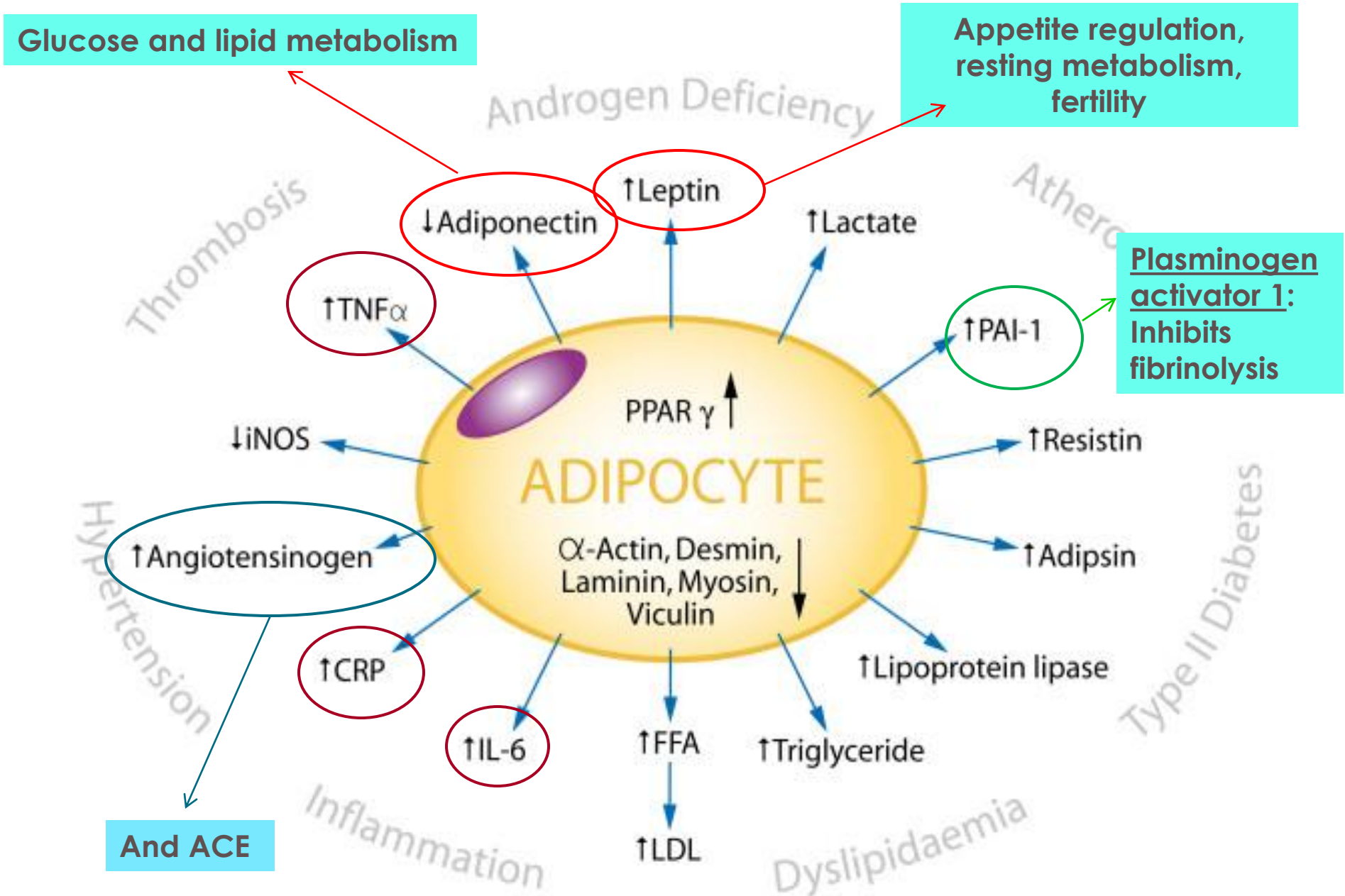
Inhibits:

- **Pathological heart remodeling (LVH)**
- **Transformation of MØ -> foam cells (cells that ingests LDL and are involved in atherosclerotic plaque growth)**

Carruthers, M et al, *Cardiovascular Diabetology*, 2008.

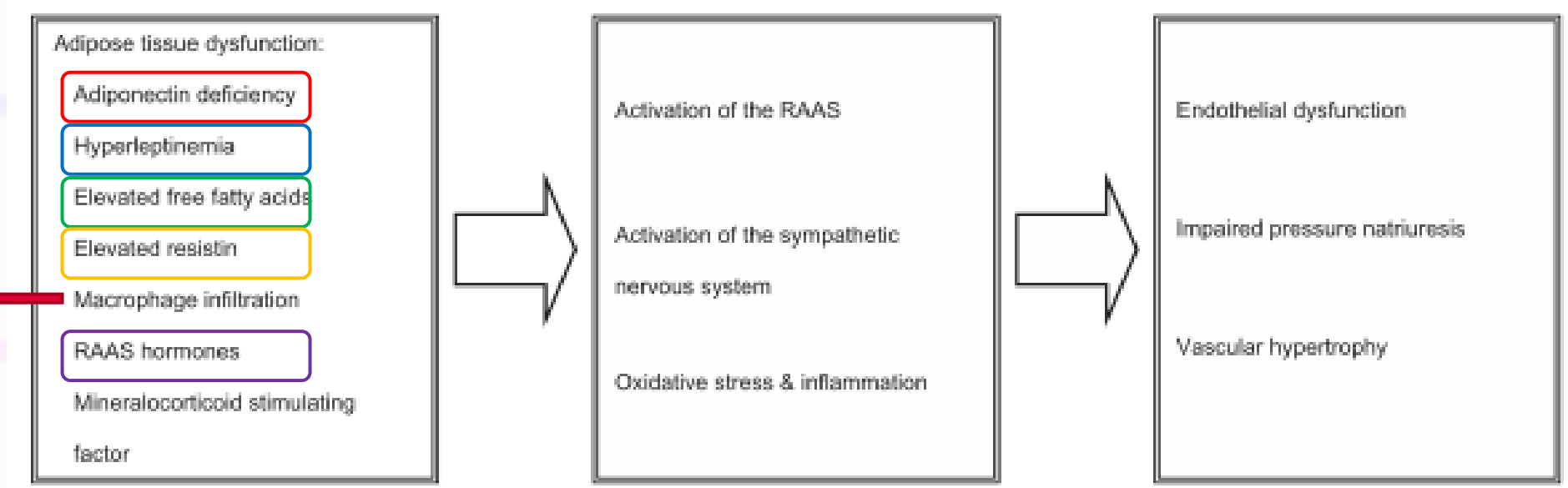


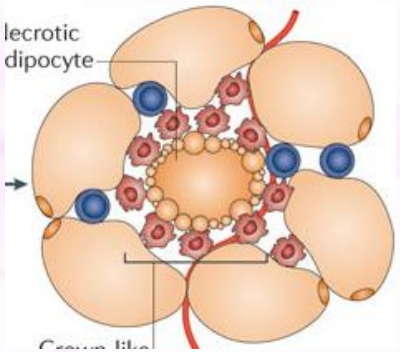
Carruthers, M et al, *Cardiovascular Diabetology*, 2008.

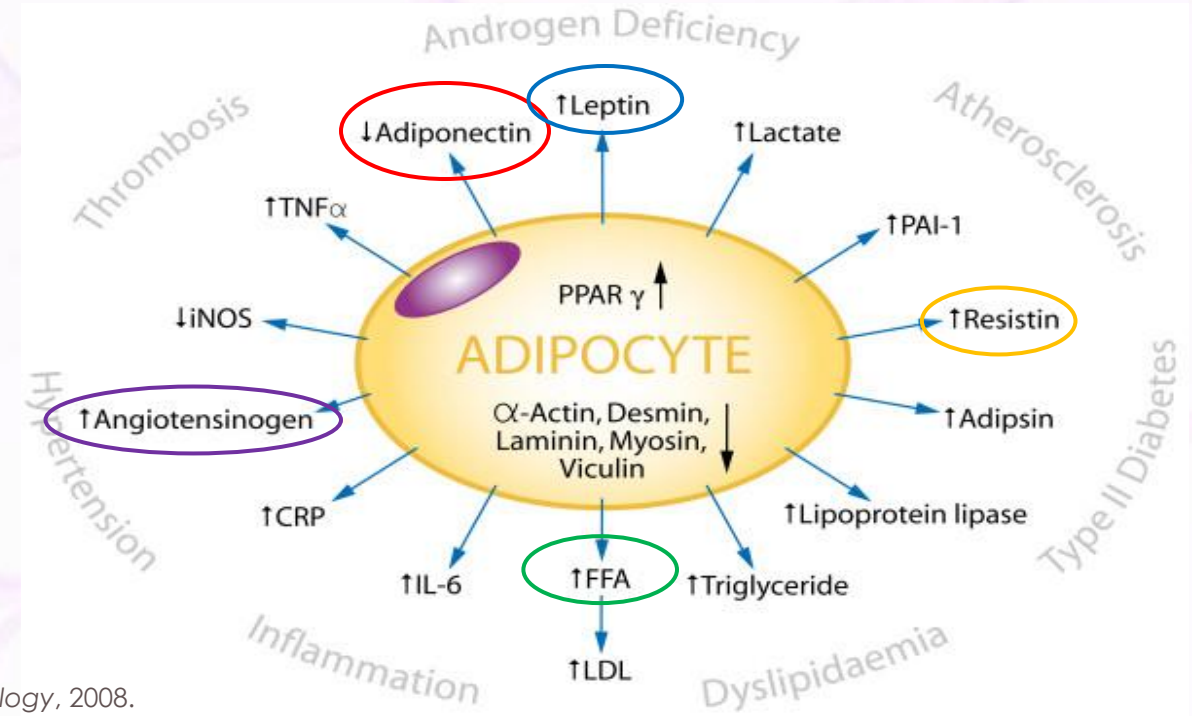


Carruthers, M et al, *Cardiovascular Diabetology*, 2008.

Dorresteijn et al, *Obesity Reviews*, 2012.







Carruthers, M et al, *Cardiovascular Diabetology*, 2008.

Dorresteijn et al, *Obesity Reviews*, 2012.

Role of Obesity in Hypertension

Adipose tissue dysfunction:

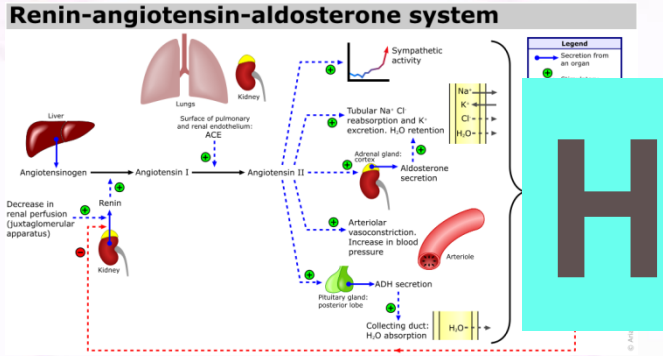
- Adiponectin deficiency
- Hyperleptinemia
- Elevated free fatty acids
- Elevated resistin
- Macrophage infiltration
- RAAS hormones
- Mineralocorticoid stimulating factor

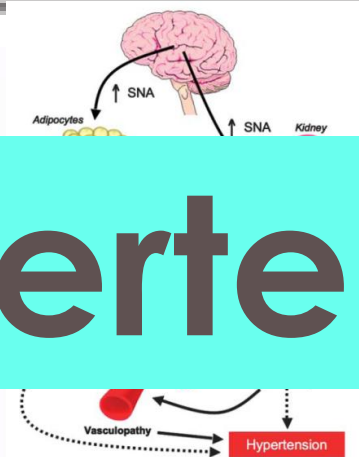
→

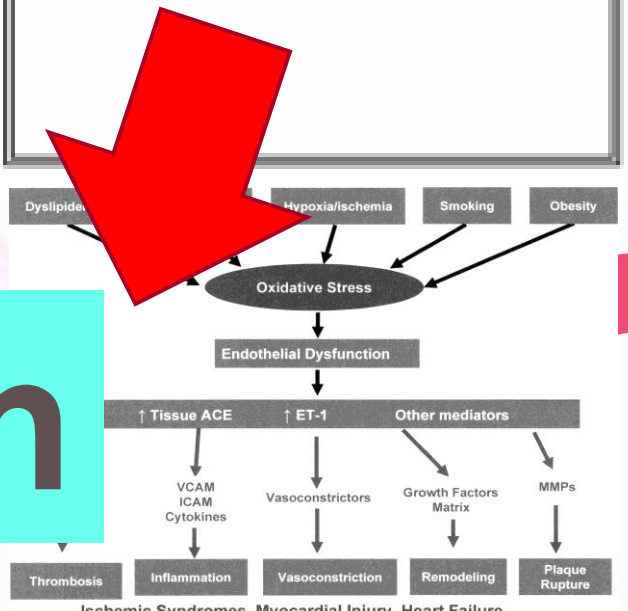
- Activation of the RAAS ✓
- Activation of the sympathetic nervous system ✓
- Oxidative stress & inflammation ✓

→

- Endothelial dysfunction
- Impaired pressure natriuresis
- Vascular hypertrophy



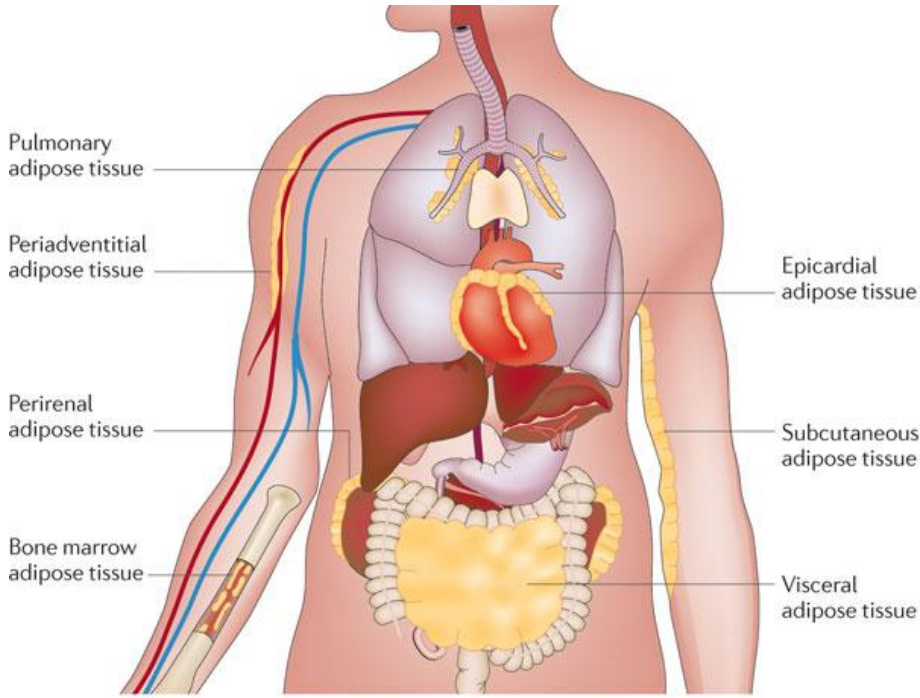




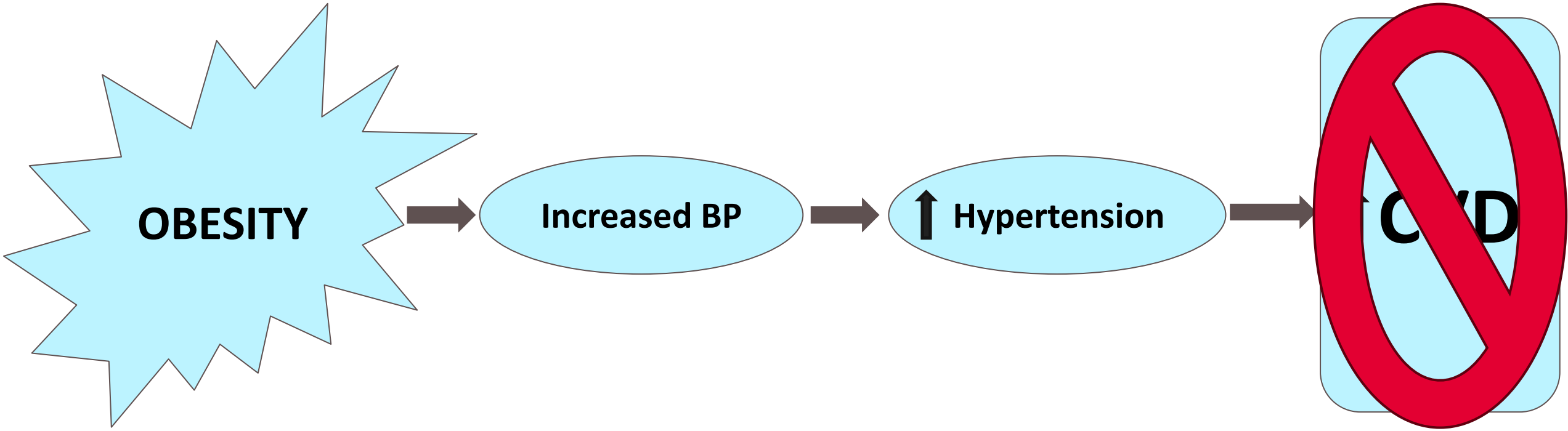
Hypertension

Obesity and Hypertension – Additional Mechanisms?

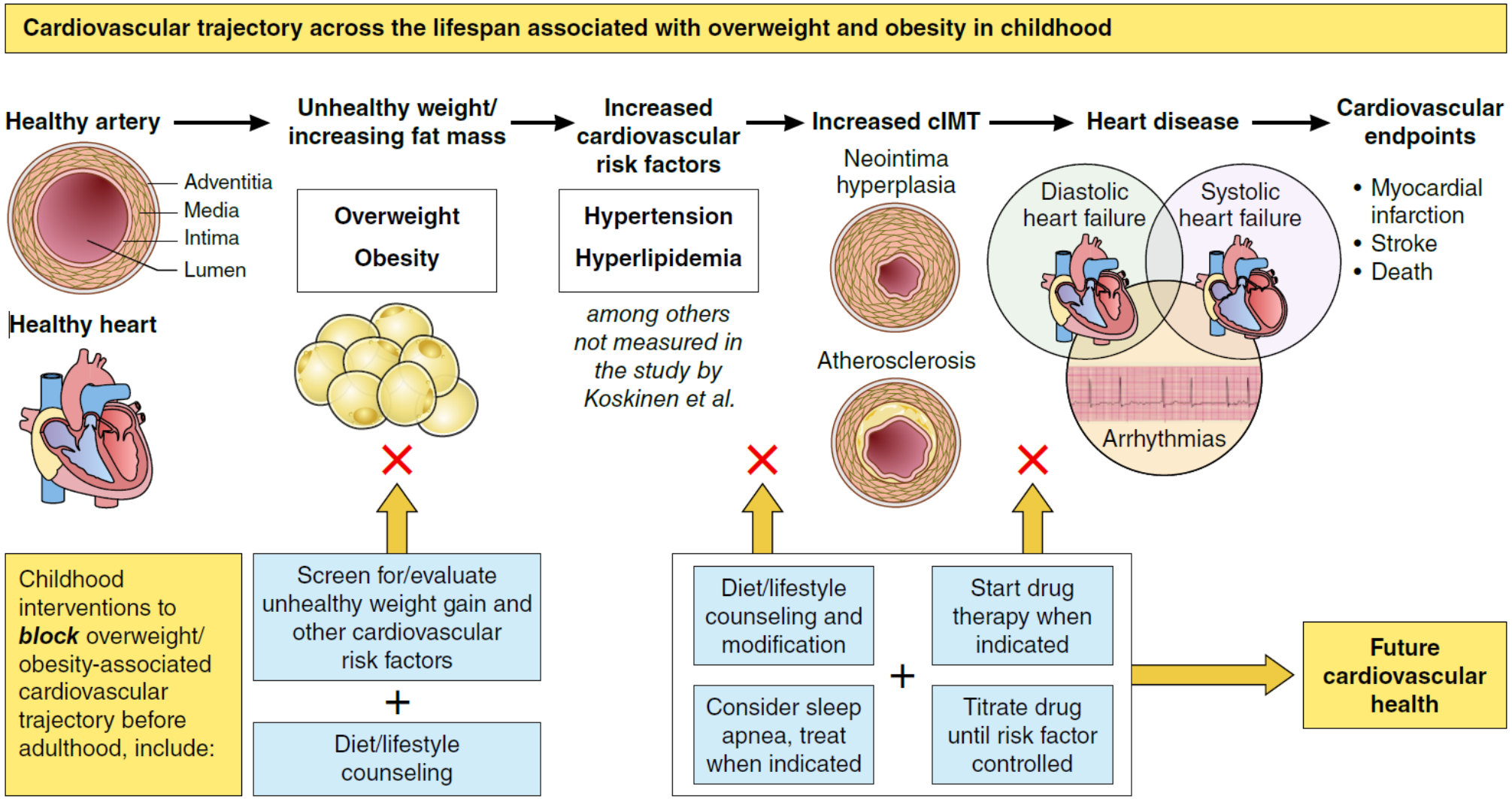
- Fat encapsulation of the kidney ->
  - Increased interstitial fluid pressure
  - Slower tubular flow rates
  - Ultimately increased sodium reabsorption



Nature Reviews Immunology **11**, 85-97 (February 2011)


OBESITY
Increased BP
Hypertension
CVD

Lifespan Approach to CVD Prevention



Turer, C., Brady T., de Ferranti, S. *Circulation, 2018.*


LOVE YOUR HEART
REDUCE SALT CONSUMPTION
CHOOSE A HEALTHY DIET
DON'T SMOKE
LIMIT ALCOHOL CONSUMPTION
MAINTAIN A HEALTHY WEIGHT
EXERCISE DAILY
PAHO
Pan American Health Organization
World Health Organization Americas
#KNOWYOURNUMBERS

Johns Hopkins Children's Center

Patients and Families | What We Treat | About Us | Research | Healthcare Professionals | Ways to Give

Pediatric Nephrology

- Overview
- Our Team
- Conditions We Treat
- Programs and Centers
  - Overview
  - Obesity Hypertension Clinic
    - Overview
    - Healthy Heart Lifestyle Guide
  - Pediatric Kidney Transplant
  - Pediatric Dialysis Unit
- Advocacy Projects
- Social Work
- Research
- Patient Stories
- Contact Us

PRINT THIS PAGE

Obesity Hypertension Clinic: Reversing the Negative Cardiovascular Effects of Weight (ReNEW)

Obesity Hypertension: What is that?

Hypertension is a condition in which one's blood pressure is consistently high. In children, hypertension is diagnosed when a child's blood pressure remains about the 95th percentile on multiple measurements over several occasions. It is often due to an underlying cause like being overweight or obese. A child is considered overweight or obese if their body mass index (BMI) is at or above 85th percentile.

Calculate your child's BMI and BMI percentile.

Why does being overweight or obese lead to hypertension?

Children (and adults) who are overweight or obese are more likely to have risk factors for heart disease like hypertension, high cholesterol, diabetes, insulin resistance and left ventricular hypertrophy (abnormal thickening of the heart). In fact, children as young as two years of age can even have atherosclerosis (hardening of the arteries). Individuals who are overweight or obese are more likely to be sensitive to salt (meaning their blood pressure is more likely to increase with high salt intake), have more hormones that cause high blood pressure and have more inflammation, which effects the blood vessels and heart.

A Hypertension, Obesity Clinic

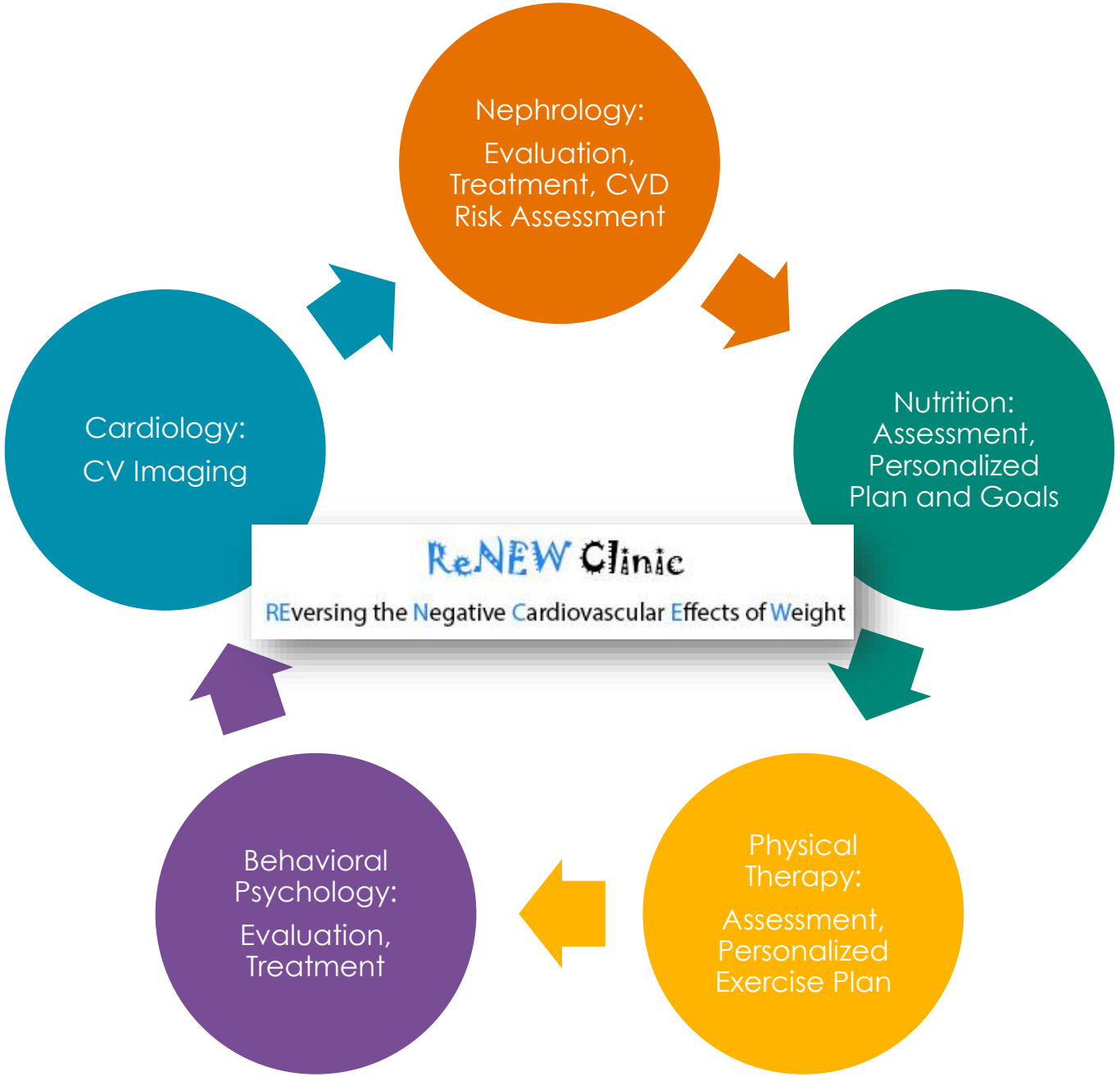
10/14/2015



Obesity Hypertension - Treatment

- Individualized
- Multidisciplinary
- Family-based
- Close follow up and monitoring, continual evaluation




Nephrology:
Evaluation, Treatment, CVD Risk Assessment
Nutrition: Assessment, Personalized Plan and Goals
Physical Therapy:
Assessment, Personalized Exercise Plan
Behavioral Psychology:
Evaluation, Treatment
Cardiology:
CV Imaging
ReNEW Clinic
REversing the Negative Cardiovascular Effects of Weight

JOHNS HOPKINS CHILDREN'S CENTER

ReNEW Clinic

REversing the Negative cardiovascular Effects of Weight

Patient Name: _____

Date of Birth: _____

Height: _____

Weight: _____

BP: _____



Your Heart Health Navigator

The ReNEW Clinic at Johns Hopkins University provides an innovative multidisciplinary approach to the evaluation and treatment of obesity hypertension. The clinic is designed to treat children with confirmed hypertension (high blood pressure) who are overweight. Children are seen every three months by each provider to provide a multifaceted approach to weight loss, cardiovascular risk assessment and hypertension treatment. Because each child is seen by multiple providers, the clinic visit will be approximately **2 ½ hours long.**

This multidisciplinary clinic will take place in the **Bloomberg Children's Center** in the **Helen B. Taussig Congenital Heart Center, Room 2201** located on the main loop in the Children's Hospital.

This form will guide you during your appointment as you meet with each provider. Take this with you and have a staff member check off the box once each visit is completed.

☐ Nephrologist

Goals:

☐ Aim to lose ___ lbs in ___ months *OR* ½ to 2 pounds each week

☐ Start/increase the dose of this medication:

_____

☐ Physical & Occupational Therapist

Goals:

☐ Echocardiogram

☐ Behavioral Psychologist

Goals:

☐ Dietician

Goals:

- Increase fruit/vegetables to _____ per _____
- Limit _____ to _____ per _____
- Avoid foods with more sodium than calories

Want more information before or after your visit? Visit http://www.hopkinschildrens.org/Heart-Healthy-Lifestyle-Guide/ for great resources and websites to help maintain a healthy lifestyle

Research Progression

- **ReNEW Clinic Cohort Study**
  - *Registry* of consecutive youth evaluated in ReNEW clinic
  - Funded by ICTR, R56, and blood, sweat, and tears

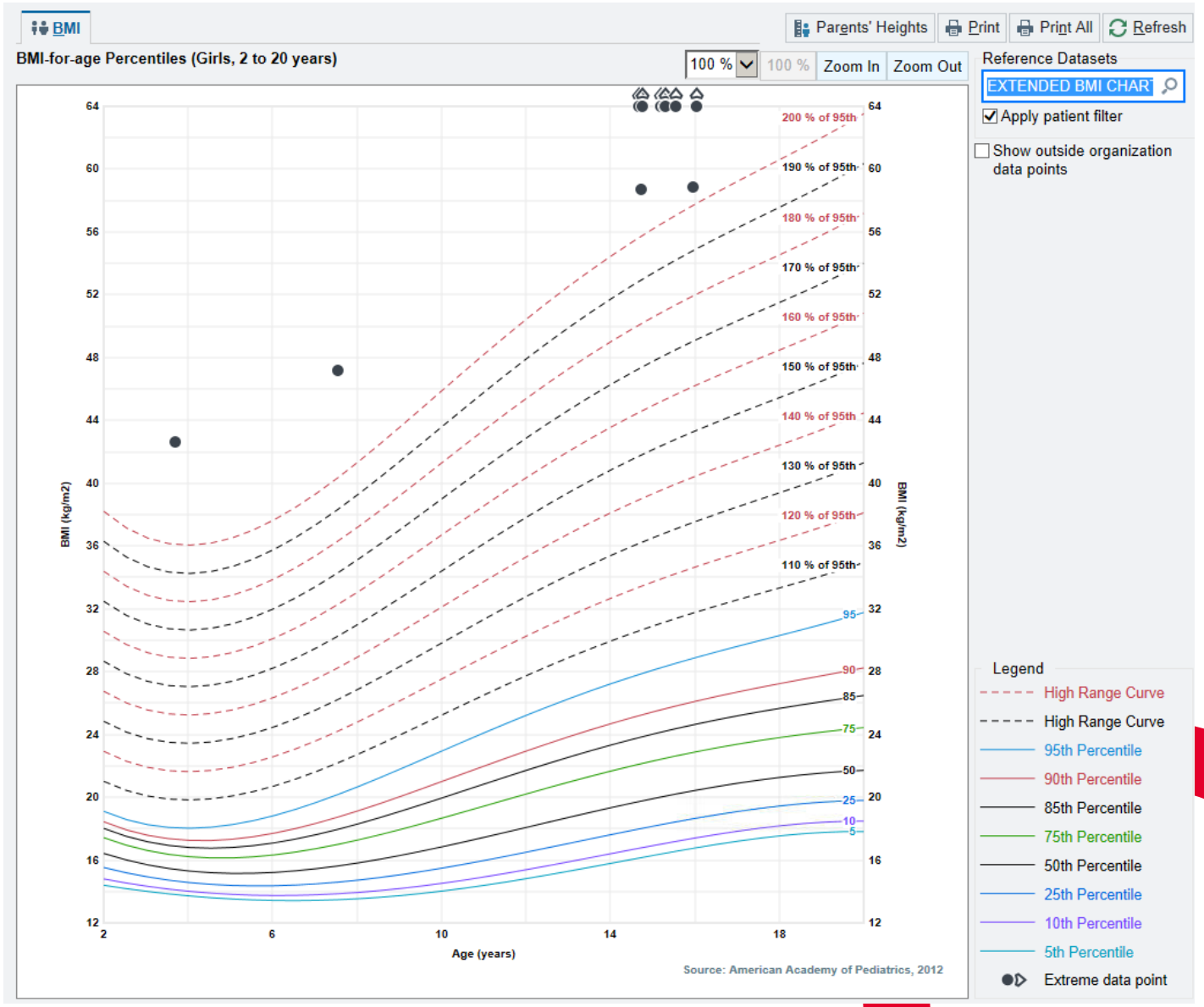


ReNEW Clinic Patient Population

- 10 years, 165 unique patients
  - Up to 22 follow up visits
- Age range 4-21 years
  - Mean: 13 years
- 39% female
- 75% Black, 15% White, 10% Other

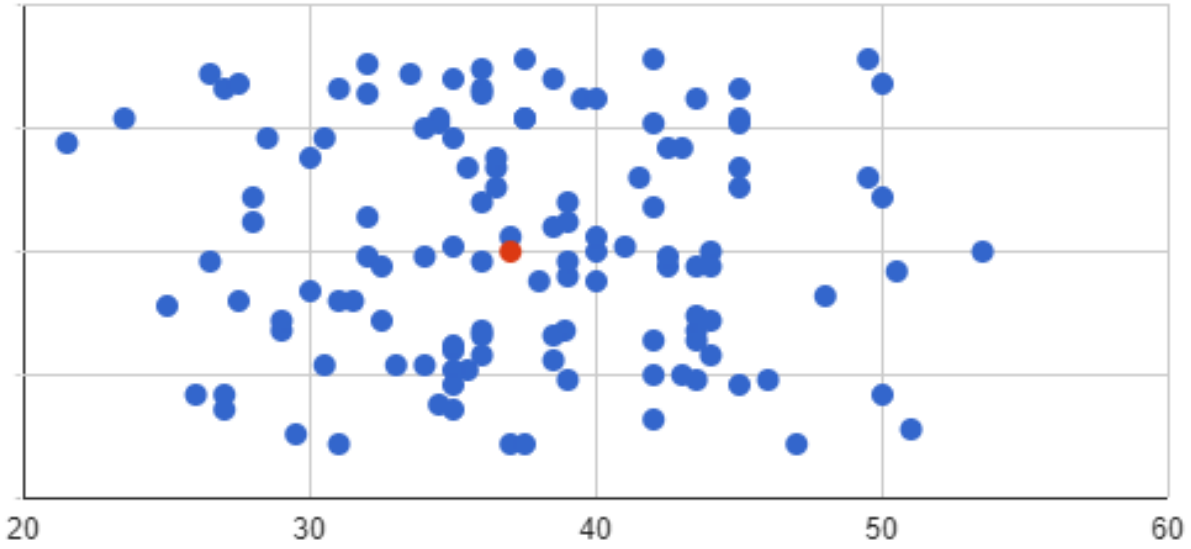
ReNEW Clinic – Patient Characteristics

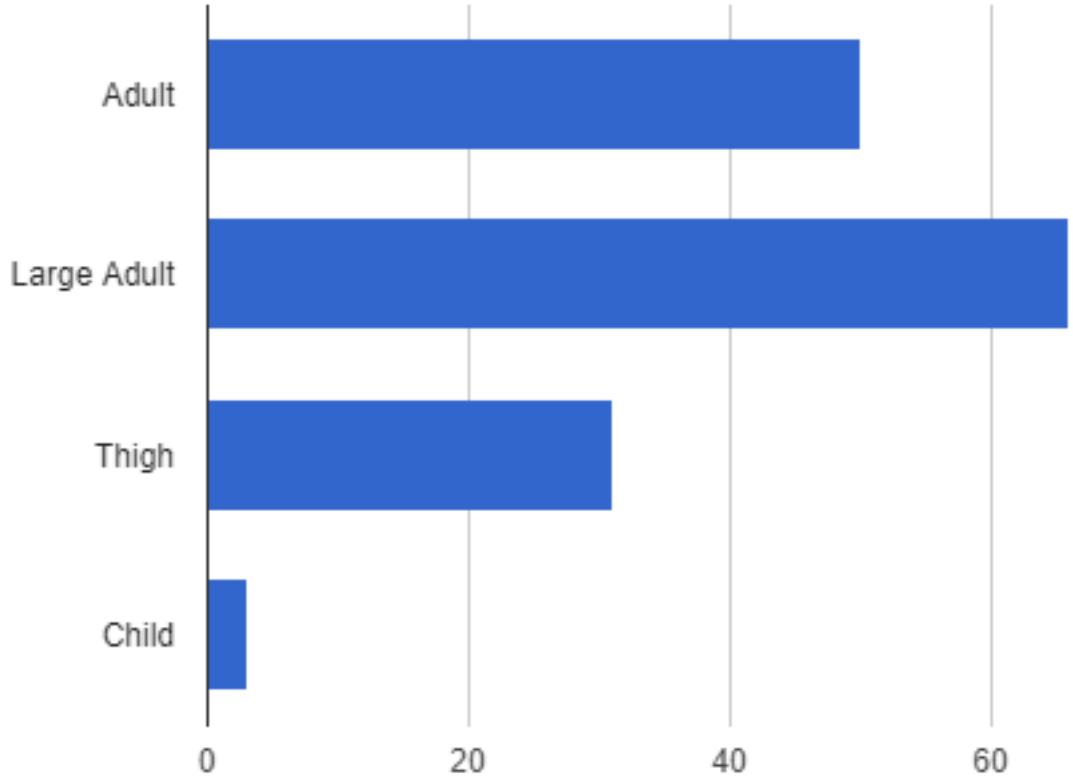
- Mean weight:105 kgs
  - Range: 31.5-229 kg
- Mean Body Mass Index: 39 kg/m^2
  - Range: 22-72 kg/m^2
  - Obesity threshold *for adults*: 30 kg/m^2



ReNEW Clinic – Mid-Arm Circumference and Cuff Size

- AC Range: 21.5cm-53.5cm
  - Mean 37.4 cm





Reversing the Negative cardiovascular Effects of Weight: Knowledge Gained from a Multidisciplinary Obesity Hypertension Clinic

CHILDREN'S NATIONAL

Received: 27 March 2018 | Revised: 31 May 2018 | Accepted: 7 June 2018

DOI: 10.1111/jch.13348

ORIGINAL PAPER

WILEY

Association of mood disorders with cardiovascular disease risk factors in overweight and obese youth with elevated blood pressure

Leah Medrano MD[1] | Kaushalendra Amatya PhD[2] | Diane Vizthum MS, RD[3] | Jeffrey J. Fadrowski MD, MHS[4] | Tammy M. Brady MD, PhD[4]



Depression and Anxiety Prevalence in a Pediatric Obesity Hypertension Clinic

Jason Ong, BPhil[1]*, Pranjal Agrawal, BA[1]*; Jeffrey S. Garofano, PhD[1]; Carisa Parrish, PhD[1,2]; Kevin J. Psoter, PhD[1]; Tammy M. Brady, MD, PhD[1]

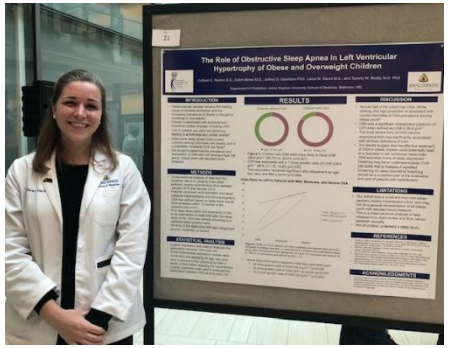
DOI: 10.1111/jch.13605

ORIGINAL PAPER

WILI

The association of obstructive sleep apnea and left ventricular hypertrophy in obese and overweight children with history of elevated blood pressure

Colleen E. Hanlon BS[1] | Edem Binka MD[2] | Jeffrey S. Garofano PhD[3] | Laura M. Sterni MD[4] | Tammy M. Brady MD, PhD[5]



THE JOURNAL OF PEDIATRICS • www.jpeds.com

ORIGINAL ARTICLES

Accuracy and Performance of Triage Blood Pressure Measurements in A Real-World Clinic Setting

William Wen, BS[1], Kevin J. Psoter, PhD, MPA[1], Barry S. Solomon, MD, MPH[1], Elaine M. Urbina, MD, MS[2],

Title: Quality and pro-inflammatory potential of diet and cardiometabolic traits in children and adolescents participating in the Reversing the Negative cardiovascular Effects on Weight (ReNEW) Clinic Cohort Study

Authors:

Kirstie Ducharme-Smith[1], Tammy M. Brady[2], Diane Vizthum[3], Laura E. Caulfield[4], Noel T. Mueller[5], Summer Rosenstock[6], Vanessa Garcia-Larsen[7*]

THE JOURNAL OF PEDIATRICS • www.jpeds.com

ORIGINAL ARTICLES

Left Ventricular Diastolic Dysfunction Among Youth with Obesity and History of Elevated Blood Pressure

Jareatha N. Abdul-Raheem, BS[3], Edem Binka, MD[1], Jennifer Roem, MS[4], Christy B. Turer, MD, MHS[5,6], Elaine M. Urbina, MD, MS[7], and Tammy M. Brady, MD, PhD[2]

Birth History and Cardiovascular Disease Risk Among Youth With Significant Obesity

Sara K. Hurley, MD[1], Diane Vizthum, RD[1], Kirstie Ducharme-Smith, PhD, MS, RDN[2], Beena D. Kamath-Rayne, MD, MPH[3], and Tammy M. Brady, MD, PhD[1,4]





THE JOURNAL OF PEDIATRICS • www.jpeds.com ORIGINAL ARTICLES

Accuracy and Performance of Triage Blood Pressure Measurements in A Real-World Clinic Setting

William Wen, BS[1], Kevin J. Psoter, PhD, MPA[1], Barry S. Solomon, MD, MPH[1], Elaine M. Urbina, MD, MS[2], and Tammy M. Brady, MD, PhD[1]



Triage

- Measured by triage nurse/MA
- Automated oscillometric device
- One triage measurement recorded into EMR



Physician

- Measured by clinic physician
- Aneroid sphygmomanometer
- Standardized to 2017 AAP Clinical Practice Guidelines
- Triplicate readings & averaged

Wen W, et al, *JPeds*, 2024.

SBP differences significantly increase with cuff size

BP measurements	Overall (n= 347) Mean (SE)	Child/ adult (n= 126) Mean (SE)	Large adult (n= 165) Mean (SE)	Thigh (n= 56) Mean (SE)	P value
SBP clinician, mmHg	126.2 (1.11)	121.9 (1.46)	128.4 (1.49)	129.2 (2.19)	0.001
SBP triage, mmHg	134.9 (1.15)	128.7 (1.56)	137.2 (1.03)	141.7 (2.59)	<0.001
SBP difference, mmHg	8.7 (0.78)	6.8 (1.29)	8.9 (1.15)	12.5 (1.844)	0.015
DBP clinician, mmHg	67.0 (1.07)	64.8 (1.23)	66.8 (1.19)	72.3 (2.99)	0.023
DBP triage, mmHg	71.0 (0.87)	67.4 (0.98)	72.0 (1.19)	76.3 (1.33)	<0.001
DBP difference, mmHg	4.1 (0.85)	2.6 (1.24)	5.2 (1.04)	4.1 (2.94)	0.440

Wen W, et al, *JPeds*, 2024.

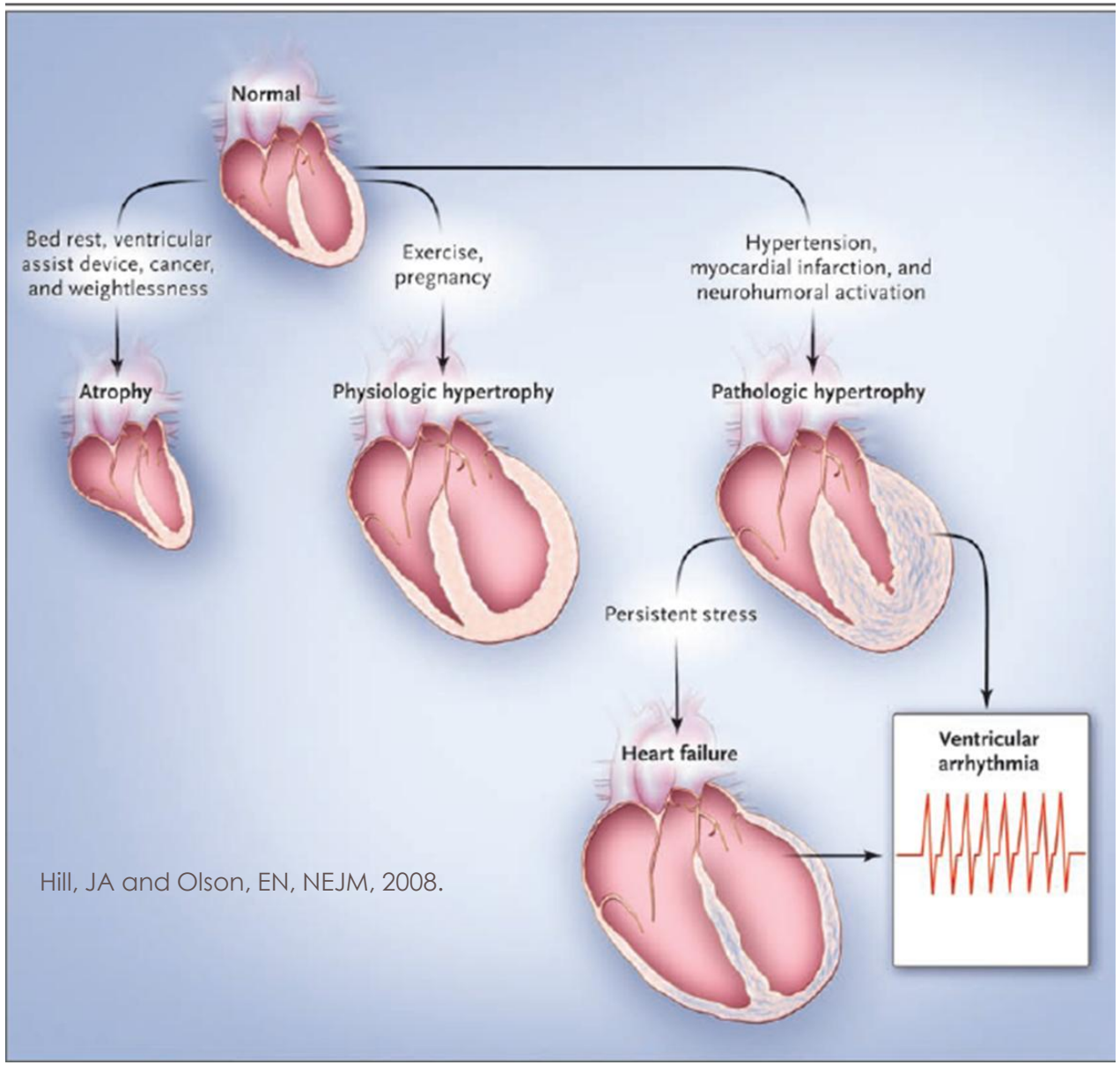
Poor agreement and diagnostic accuracy seen across all cuff sizes

	Number of encounters n (%)	Prevalence of hypertensive BP by clinic measurement* (95% CI)	Overall agreement between clinic and triage BP (95% CI)	Sensitivity of triage readings (95% CI)	Specificity of triage readings (95% CI)	PPV of triage readings (95% CI)	NPV of triage readings (95% CI)
Overall	347 (100%)	52.7% (46.4, 59.0%)	57.6% (52.5, 62.7%)	52.6% (44.1, 61.2%)	63.4% (56.1, 70.7%)	60.8% (52.3, 69.2%)	55.3% (47.6, 63.0%)
Cuff size							
Child & Adult	126 (36.5%)	46.8% (38.1, 55.5%)	54.7% (45.2, 64.1%)	57.1% (42.4, 71.7%)	51.8% (38.7, 64.9%)	52.3% (40.6, 64.0%)	57.6% (43.7, 71.5%)
Large Adult	165 (47.6%)	54.5% (46.3, 62.8%)	60.2% (54.8, 65.5%)	51.0% (39.2, 62.8%)	71.2% (63.0, 79.4%)	68.2% (56.8, 79.7%)	54.0% (44.8, 63.1%)
Thigh	56 (15.9%)	60.7% (43.7, 77.7%)	55.3% (41.3, 69.2%)	44.0% (27.0, 61.0%)	69.1% (49.5, 88.8%)	67.7% (47.0, 88.4%)	53.1% (32.4, 73.8%)

*Participants were considered to have a hypertensive blood pressure if their average manual BP measurement was ≥ age-sex-height specific 95th percentile when <13 years of age or ≥ 130/80 mmHg for those 13 years of age or older.

Left Ventricular Hypertrophy

- **LVH:** a pathologic remodeling of the heart in response to an increased afterload
- **LVH:** an independent predictor of CV mortality in adults
  - Adults with LVH (***LVMI > 51 g/ m$^{2.7}$***) have a 4 x increased risk of CV morbidity
    - de Simone et al, *JACC*, 1995
- **LVH:** no outcome data to determine ideal definition in children



Prevalence of LVH in ReNEW



- 54 children
- Age range 6-21 years (mean: 13.7 years)
- 57% had HTN

	Published LVH Prevalence (%)	Our Population LVH Prevalence (%)
LVMI>38.6 g/m$^{2.7}$	41+**	74
LVMI > 95th%	34-38**	69
LVMI > 51g/m$^{2.7}$	8-14+***	30

1.8 - 2x !!

* Sorof JM et. al. Pediatrics. 2003; + Daniels SR et. al. Circulation. 1998

** 4th report. Pediatrics. 2004

Patient Characteristics mean (SD) or % (n)	Historic LVH Definitions		Current LVH Definitions		p-value
	LVMI>38.6 g/m$^{2.7}$	LVMI>95th %ile	LVMI>51 g/m$^{2.7}$	LV mass/BSA*	
% Patients	**74% (40)**	**69% (37)**	**30% (16)**	**17% (9)**	**<0.001**
Age (years)	**13.7 (4.0)**	**13.9 (4.0)**	**16.3 (2.8)**	**16.9 (2.3)**	**0.009**
Male	55% (22)	54% (20)	63% (10)	78% (7)	0.6
African American Race	90% (36)	89% (33)	94% (15)	89% (8)	0.08
BMI (kg/m^2)	**38.7 (9.9)**	**39.3 (10.0)**	**45.7 (9.2)**	**44.5 (8.3)**	**0.0005**
BMI z-score	**2.6 (0.4)**	**2.6 (0.4)**	**2.8 (0.3)**	**2.8 (0.3)**	**0.04**
Waist z-score	2.6 (0.6)	2.6 (0.6)	2.9 (0.5)	2.8 (0.4)	0.2
SBP z-score	**1.2 (1.2)**	**1.2 (1.2)**	**1.4 (1.2)**	**1.8 (1.4)**	**0.5**
DBP z-score	-0.1 (1.0)	-0.1 (1.0)	0.1 (1.1)	0.4 (1.3)	0.4
% with Hypertension^{+}	**60% (24)**	**62% (23)**	**69% (11)**	**67% (6)**	**0.8**
Ejection Fraction	64.0 (6.2)	64.5 (5.9)	63.1 (5.8)	64.3 (3.0)	0.5

	Historic LVH Definitions		Current LVH Definitions	
	LVMI>38.6 $g/m^{2.7}$ OR (95% CI)	LVMI>95th %ile OR (95% CI)	LVMI>51 $g/m^{2.7}$ OR (95% CI)	LVM/BSA* OR (95% CI)
Hypertension				
Unadjusted	1.50 (0.44, 5.10)	1.85 (0.58, 5.90)	1.98 (0.58, 6.80)	1.60 (0.36, 7.21)
Adjusted for age, sex, race	1.24 (0.29, 5.30)	1.68 (0.45, 6.35)	0.80 (0.17, 3.72)	0.46 (0.07, 3.08)
Adjusted for age, sex, race AND BMI	1.26 (0.29, 5.47)	1.75 (0.45, 6.81)	0.80 (0.13, 4.91)	0.40 (0.05, 2.99)
BMI				
Unadjusted	1.03 (0.96, 1.11)	1.05 (0.98, 1.14)	**1.19 (1.08, 1.33)**	1.09 (1.01, 1.18)
Adjusted for age, sex, race	1.05 (0.94, 1.17)	1.07 (0.96, 1.19)	**1.21 (1.04, 1.41)**	1.08 (0.98, 1.20)
Adjusted for age, sex, race AND HTN	1.05 (0.94, 1.17)	1.07 (0.96, 1.19)	**1.21 (1.04, 1.40)**	1.09 (0.98, 1.21)

Depression and Anxiety Prevalence in a Pediatric Obesity Hypertension Clinic

Jason Ong, BPhil[1]*, Pranjal Agrawal, BA[1]*; Jeffrey S. Garofano, PhD[1]; Carisa Parrish, PhD[1,2];

Kevin J. Psoter, PhD[1]; Tammy M. Brady, MD, PhD[1]

- 128 patients
  - Mean age 14.1 yrs, 40% female, 74% Black
- Baseline prevalence:
  - Depression: 37.3% (8.4x national average)
  - Anxiety: 28.9% (3x national average[95])
- Prevalence increased post-COVID

Conclusions

- Obesity and hypertension are increasingly prevalent in children
- Increasing obesity leads to adipose tissue dysfunction → hypertension and CVD events
- **Primary prevention of overweight/obesity is key for CVD prevention**
- Youth with obesity-related hypertension have multiple co-morbidities which increase CVD risk and benefit from a multidisciplinary approach to treatment



Children's National®

Thank you!

tmbrady@childrensnational.org

How to Claim CE Credit

1. Submit the **attendance code VASYEH** by:
   - Texting to **301-273-7643**, or
   - Entering **online** at ce.childrensnational.org/code
2. Complete the Evaluation
3. Download CE Certificate

Credit may be claimed up to 60 days from the date of the live event.

Weight Bias as a Clinical Risk Factor: Mental Health Considerations in Pediatric Obesity



Sarah Hornack, PhD

Assistant Professor of Psychiatry and Behavioral Sciences

September 18, 2026

Children's National

Disclosures

- I have no actual or potential conflict of interest in relation to this program/presentation.

Objectives

1. Describe the prevalence and forms of weight bias and weight-based victimization experienced by children and adolescents with obesity.

2. Explain the associations between weight-based victimization and adverse mental health outcomes.

3. Identify strategies for reducing weight bias and promoting psychologically safe, patient-centered care for youth with obesity.



Mental Health Comorbidities of Obesity



- For youth with obesity, the odds of having a behavioral health diagnosis are 7.15 times

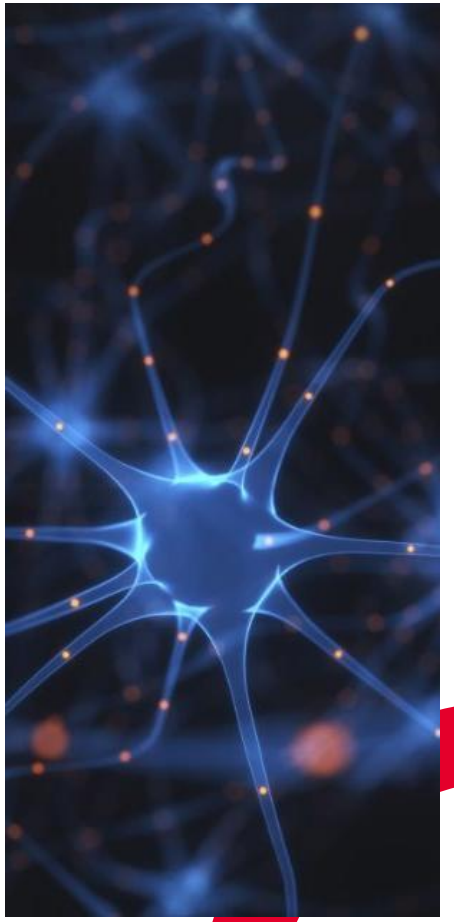
- Overall prevalence of behavioral health conditions in youth with obesity was 57% in one study
  - 10.1 – 26.7% with major depressive disorder
  - 9.7% with anxiety
  - 9.3 – 20.2% of youth endorse disordered eating behaviors
  - 27% of adults with obesity have ADHD; children with ADHD have 4x greater risk of developing obesity

- Significant impacts to health-related quality of life

(Beltran-Garrayo, 2023; Rao et al., 2020; Chaves et al., 2024; Schwimmer et al., 2003))

What contributes to this overlap?

- Multiple factors influence the co-occurrence of obesity and behavioral health concerns
  - Symptoms impact behavior (ex., executive functioning deficits and meal planning, depression and emotional eating)
  - Influence of common brain pathways with pathophysiology:
    - Hypothalamus
    - Frontal lobe
    - Reward system
  - **Weight stigma**



(O'Hara et al, 2020)

Weight-Based Stigma

- Social stereotypes and misconceptions about people with obesity
- Social devaluation and denigration of people because of their body weight
- **Weight-based discrimination:** overt forms of weight-based prejudice and unfair treatment

(Durrer et al, 2017; Phul, 2019)

Do not edit
How to change the design



In what settings do our patients encounter weight-based stigma?

The Slido app must be installed on every computer you're presenting from

slido

Weight-based stigma presents…

Schools

Workplaces

Social Relationships

Media

Healthcare

Home

(Puhl, 2019; Durrer et al., 2017))

Perpetrators & Types of Weight-Based Bullying



Peers 92%

Friends 70%

PE Teachers/Coach 42%

Parents 36%

Teachers 27%

Verbal Teasing 88%

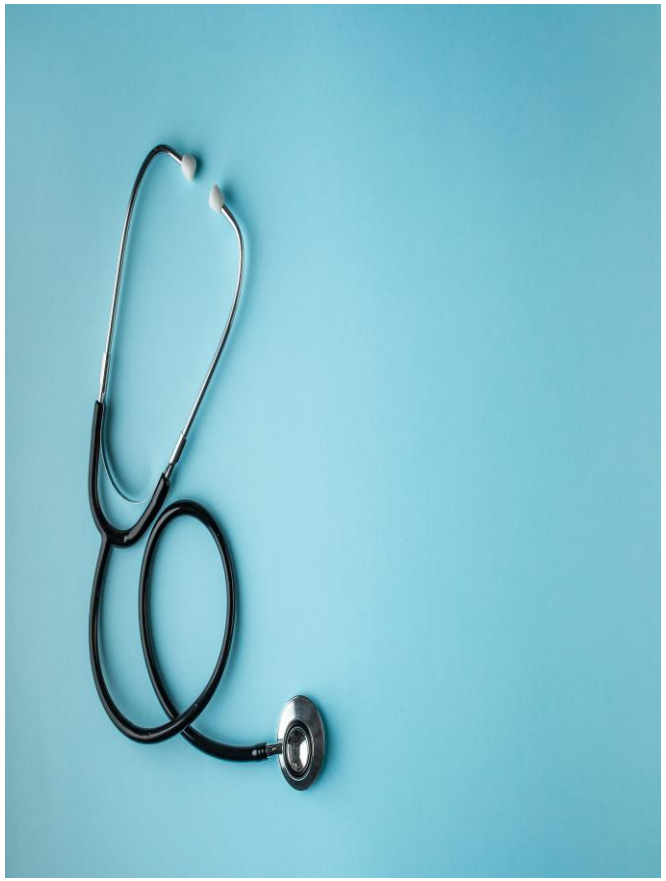
Relational Victimization 82%

Physical Aggression 61%

Cyber-bullying 61%

(Puhl, Peterson, & Leudicke, 2013)

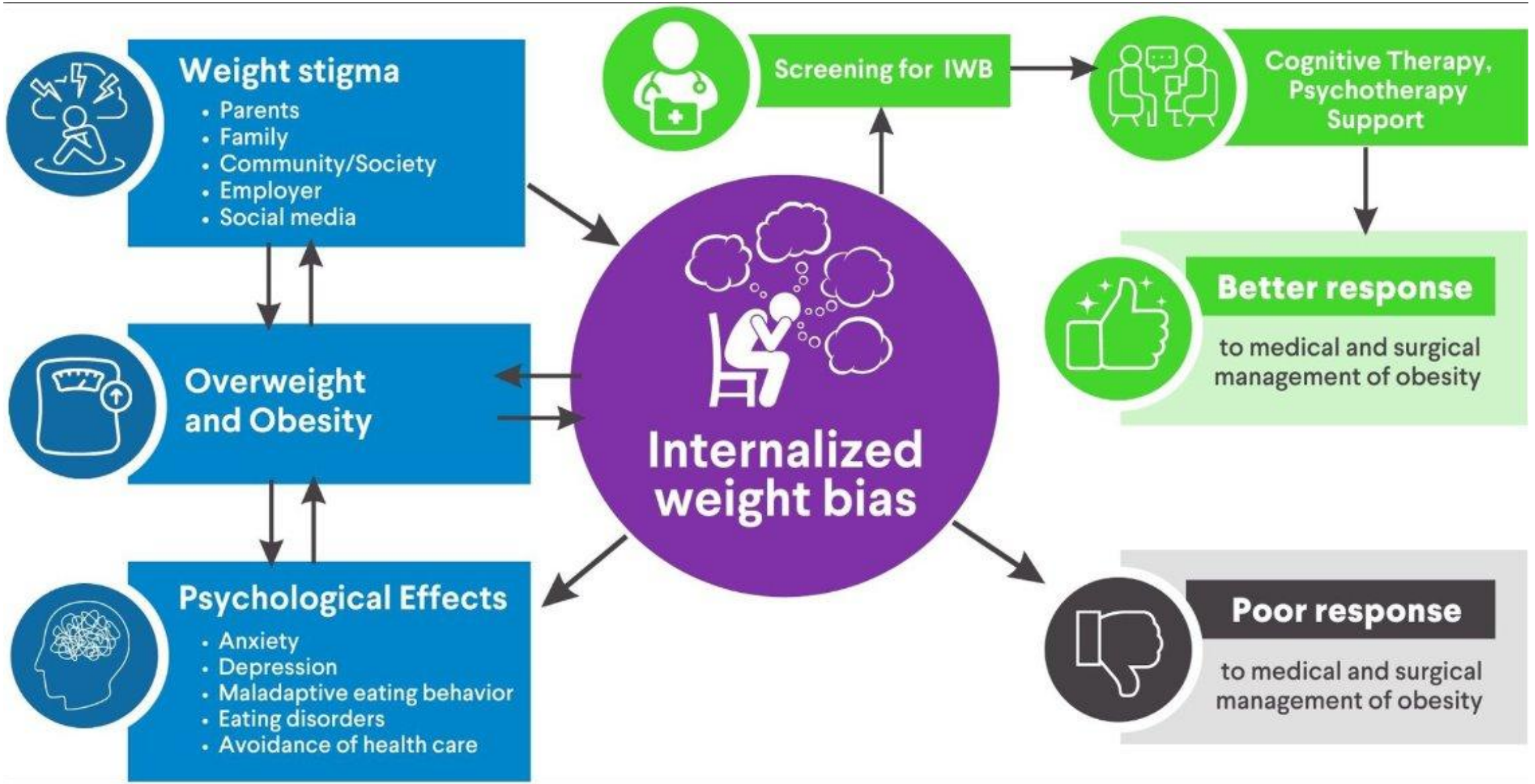
Weight-Based Stigma in Healthcare



Patients with obesity stereotyped as:

Non-compliant	**Sloppy**
Lazy	**Unsuccessful**
Lacking in self-control	**Unintelligent**
Awkward	**Dishonest**

(Puhl & Heuer, 2009; Hebel & Xu, 2001; Phelan et al., 2015)



Children's National

(Nadolsky et al., 2023)

Combatting Weight Stigma in Direct Care

- Use neutral and precise language
  - Person-first ➡ patient with obesity
  - "BMI" and "weight" viewed as neutral terms
- Utilize patient-centered communication approaches
- Screen for internalized weight bias
- Consider how offices are equipped for patients with larger bodies
- Build provider empathy via perspective-taking exercises
- Reduce focus on weight
- Institute zero-tolerance policy around denigrating comments or humor related to appearance
- Educate providers about the social, biological, genetic, environmental, and psychological contributors to weight gain



(Phelan et al., 2015; Ko et al, 2026; Ivezaj et al., 2020)

Identifying & Intervening- Weight-based Victimization

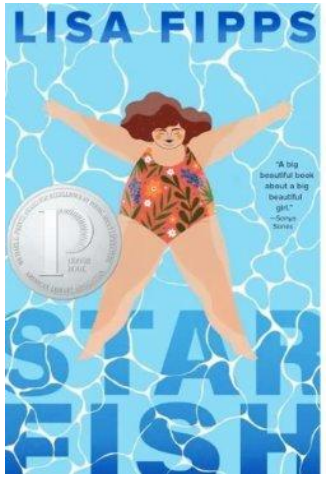
- The AAP recommends a conversation about bullying at 6 y.o. well visit
- Screen for bullying and its harmful effects (HEEADSSS)
  - Ask about children's online lives
  - Use of open-ended questions
- Provide families with resources
- Encourage collaboration
  - Care provider, family, child, school
  - Referral to mental health clinician
- Promote adaptive coping strategies

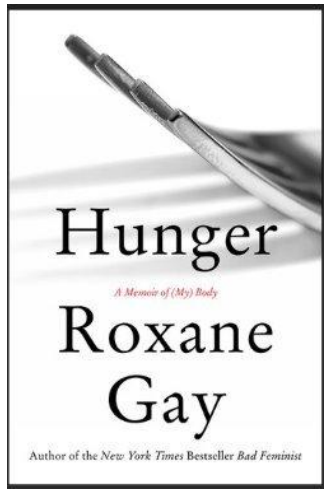


Children's National

(Stephens et al., 2018)

Resources





- Obesity Action Coalition handout for parents:

https://www.obesityaction.org/wp-content/uploads/Kids-Corner-Weight-Based-Bullying-in-Children.pdf

- UC Rudd Center:

https://uconnruddcenter.org/research/weight-bias-stigma/families/

- Parent's guide for discussing weight:

https://www.bath.ac.uk/publications/talking-to-your-child-about-weight-a-guide-for-parents-and-caregivers-of-children-aged-4-11-years/attachments/talking-to-children-about-weight-guide.pdf

Children's National

References

Beltrán-Garrayo L, Solar M, Blanco M, Graell M, Sepúlveda AR. Examining associations between obesity and mental health disorders from childhood to adolescence: a case-control prospective study. *Psychiatry Res*. 2023;326:115296. doi:10.1016/j.psychres.2023.115296.

Chaves E, DiPangrazio A, Paponetti M, Stout G. Disordered eating in pediatric obesity. *Pediatr Clin North Am*. 2024;71(5):879-896. doi:10.1016/j.pcl.2024.06.009.

Dąbrowska J, Wójcik M, Samek I, Jańczyk M, Bator D, Milanowska J. Obesity and mental health. J Educ Health Sport. 2020;10(6):199-205. doi:10.12775/JEHS.2020.10.06.022

Durrer D, Pasi P, Peterli R, et al. Improving obesity management: Insights from the ACTION Switzerland survey of people with obesity, physicians and dietitians. *Clinical Obesity*. 2025; 15(2):e12716. doi:10.1111/cob.12716

Hebl, M. R., & Xu, J. (2001). Weighing the care: Physicians' reactions to the size of a patient. *International Journal of Obesity, 25*(8), 1246–1252. https://doi.org/10.1038/sj.ijo.0801681

Ivezaj, V., Lydecker, J.A. and Grilo, C.M. (2020), Language Matters: Patients' Preferred Terms for Discussing Obesity and Disordered Eating with Health Care Providers After Bariatric Surgery. Obesity, 28: 1412-1418. https://doi.org/10.1002/oby.22868

Ko, T.Y.L., Contreras, F., Al-Najim, W. *et al.* "What Patients Want": a qualitative study of expectations and ideal clinical encounters in obesity consultations. *Int J Obes* (2026). https://doi.org/10.1038/s41366-026-02170-8

Nadolsky, Karl et al. American Association of Clinical Endocrinology Consensus Statement: Addressing Stigma and Bias in the Diagnosis and Management of Patients with Obesity/Adiposity-Based Chronic Disease and Assessing Bias and Stigmatization as Determinants of Disease Severity. Endocrine Practice , Volume 29, Issue 6, 417 – 427

O'Hara VM, Curran JL, Browne NT. The co-occurrence of pediatric obesity and ADHD: an understanding of shared pathophysiology and implications for collaborative management. Curr Obes Rep. 2020;9(4):447-456. doi:10.1007/s13679-020-00410-0.

Phelan SM, Burgess DJ, Yeazel MW, Hellerstedt WL, Griffin JM, van Ryn M. Impact of weight bias and stigma on quality of care and outcomes for patients with obesity. *Obes Rev*. 2015;16(4):319-326. doi:10.1111/obr.12266

References

Puhl, R.M. and Heuer, C.A. (2009), The Stigma of Obesity: A Review and Update. Obesity, 17: 941-964. https://doi.org/10.1038/oby.2008.636

Puhl RM, Latner JD, O'Brien K, Luedicke J, Forhan M, Danielsdottir S. Cross-national perspectives about weight-based bullying in youth: nature, extent and remedies. *Pediatr Obes*. 2016;11(4):241-250. doi:10.1111/ijpo.12051

Puhl RM, Peterson JL, Luedicke J. Weight-based victimization: bullying experiences of weight loss treatment-seeking youth. *Pediatrics*. 2013;131(1):e1-e9. doi:10.1542/peds.2012-1106

Rao WW, Zong QQ, Zhang JW, et al. Obesity increases the risk of depression in children and adolescents: results from a systematic review and meta-analysis. *J Affect Disord*. 2020;267:78-85. doi:10.1016/j.jad.2020.01.154.

Schwimmer JB, Burwinkle TM, Varni JW. Health-Related Quality of Life of Severely Obese Children and Adolescents. *JAMA*. 2003;289(14):1813–1819. doi:10.1001/jama.289.14.1813

Stephens MM, Cook-Fasano HT, Sibbaluca K. Childhood bullying: implications for physicians. *Am Fam Physician*. 2018;97(3):187-192.

Thank you!
Questions?

shornack@childrensnational.org

Surgical Treatment of Pediatric Obesity

Mark L. Kovler, MD
Director of Pediatric and Adolescent Bariatric Surgery
Division of General & Thoracic Surgery
Children's National Hospital

Two Decades of Progress:
Advancing Pediatric Obesity Care
September 18, 2026

Children's National

Children's National
PEDIATRIC BARIATRIC SURGERY PROGRAM
HEALTHIER KIDS • BRIGHTER FUTURES

Continuing Education – Learner Notification

Two Decades of Progress: Advancing Pediatric Obesity Care

September 18th, 2026

Notice of Requirement for Successful Completion

Participants may earn CE credit for this activity by attending the entire education session and completing the required evaluation. Instructions for claiming CE credit, including the attendance code, will be provided at the conclusion of the activity.

Nurses: Children's National Hospital designates this live activity for a maximum of 5.0 ANCC contact hours for nurses. Nurses should claim only the credit commensurate with the extent of their participation in the activity.

Physicians: Children's National Hospital designates this live activity for a maximum of 5.0 AMA PRA Category 1 Credits™ for physicians. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Pharmacists: Children's National Hospital is accredited by the Accreditation Council for Pharmacy Education (ACPE) as a provider of continuing pharmacy education. This program meets ACPE criteria for 5.0 contact hours.

Psychologists: Continuing Education (CE) credits for psychologists are provided through the co-sponsorship of the American Psychological Association (APA) Office of Continuing Education in Psychology (CEP). The APA CEP Office maintains responsibility for the content of the programs. Children's National Hospital designates this live activity for a maximum of 5.0 CE credits (Instructional Level: Intermediate Learning).

IPCE: This activity was planned by and for the healthcare team, and learners will receive 5.0 Interprofessional Continuing Education (IPCE) credit for learning and change.

Relevant Financial Relationships

The planning committee and presenters have no relevant financial relationships with ineligible companies.

Financial and In-Kind Commercial Support

No financial nor in-kind commercial support was received for this education activity.

JOINTLY ACCREDITED PROVIDER™ INTERPROFESSIONAL CONTINUING EDUCATION

In support of improving patient care, Children's National Hospital is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team. Children's National Hospital Accreditation Provider# 4008362.

Objectives

At the conclusion of this presentation, learners will be able to:



1

Identify

children and adolescents who should be considered for referral for metabolic and bariatric surgery.

2

Describe

laparoscopic sleeve gastrectomy and the expected safety, weight, and health outcomes following surgery.

3

Discuss

the role of metabolic surgery within a multidisciplinary, multimodal approach to pediatric obesity treatment.

Children's National

PEDIATRIC BARIATRIC SURGERY PROGRAM

HEALTHIER KIDS • BRIGHTER FUTURES

The Evolution of Pediatric Bariatric Surgery

More than 50 years of experience, with expanding evidence and access.

1975

First major pediatric series

25 patients <20 years old underwent open Roux-en-Y gastric bypass.

Early 2000s

The laparoscopic era

Introduction and widespread adoption of minimally invasive techniques, reducing procedural burden and expanding access.

Mid-2000s

Building the evidence

Large prospective studies (e.g., Teen-LABS) established safety, efficacy, and durable metabolic outcomes in adolescents.

2010s

Multidisciplinary programs

Integration of surgery, obesity medicine, nutrition, psychology, and longitudinal follow-up.

Children's National

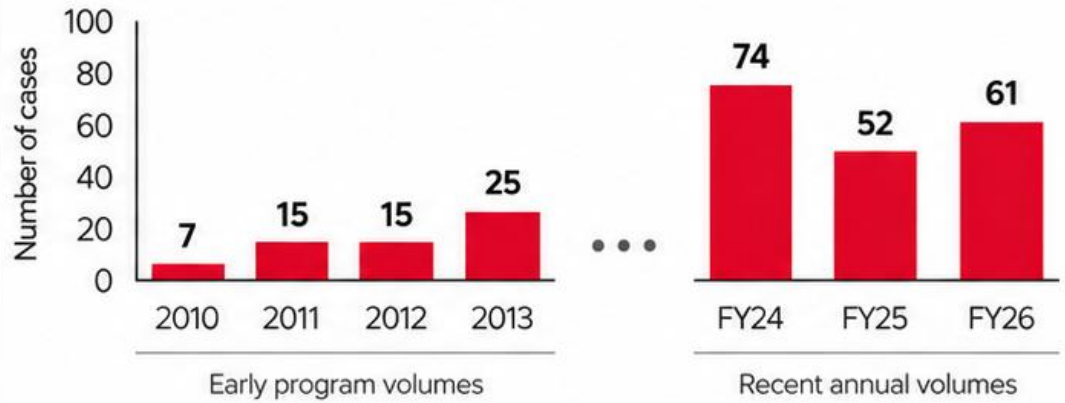
Pediatric Bariatric Surgery Program

2010
Program established

1,000+
Primary sleeve gastrectomies

Highest volume pediatric bariatric surgery program in the United States

Program Volume



Myths & Misconceptions Persist

Despite decades of experience and evidence, hesitation about pediatric bariatric surgery remains.

“They’re too young.”

Shouldn’t we wait until adulthood?

“Surgery should be the last resort.”

Have we really tried everything else?

“They need to prove they can lose weight first.”

Shouldn’t they demonstrate success before surgery?

“Do we still need surgery in the GLP-1 era?”

Haven’t medications changed everything?

What does the evidence actually tell us?

Children’s National | PEDIATRIC BARIATRIC SURGERY PROGRAM

HEALTHIER KIDS • BRIGHTER FUTURES

Who Should Be Referred for Metabolic & Bariatric Surgery?

Current AAP guideline recommendations

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height}^2\ (\text{m}^2)}$$

CLASS 3 OBESITY

BMI ≥ 40 kg/m²

OR ≥ 140% of the 95th percentile for age and sex

No comorbidity required

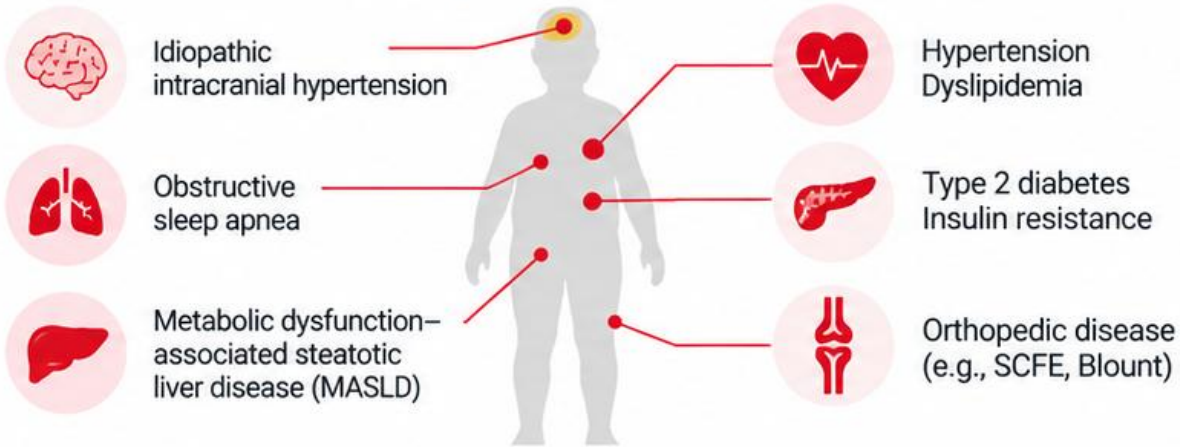
CLASS 2 OBESITY + COMORBIDITY

BMI ≥ 35 kg/m²

OR ≥ 120% of the 95th percentile for age and sex

Plus clinically significant obesity-related comorbidity

Common Obesity-Related Comorbidities in Youth



CLINICAL PRACTICE GUIDELINE Guidance for the Clinician in Rendering Pediatric Care

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

Clinical Practice Guideline for the Evaluation and Treatment of Children and Adolescents With Obesity

Sarah E. Hampl, MD, FAAP,[a] Sandra G. Hassink, MD, FAAP,[b] Asheley C. Skinner, PhD,[c] Sarah C. Armstrong, MD, FAAP,[d] Sarah E. Barlow, MD, MPH, FAAP,[e] Christopher F. Bolling, MD, FAAP,[f] Kimberly C. Avila Edwards, MD, FAAP,[g] Ihuoma Eneli, MD, MS, FAAP,[h] Robin Hamre, MPH,[i] Madeline M. Joseph, MD, FAAP,[j] Doug Lunsford, MEd,[k] Eneida Mendonca, MD, PhD, FAAP,[l] Marc P. Michalsky, MD, MBA, FAAP,[m] Nazrat Mirza, MD, ScD, FAAP,[n] Eduardo R. Ochoa, Jr, MD, FAAP,[o] Mona Sharifi, MD, MPH, FAAP,[p] Amanda E. Staiano, PhD, MPP,[q] Ashley E. Weedn, MD, MPH, FAAP,[r] Susan K. Flinn, MA,[s] Jeanne Lindros, MPH,[t] Kymika Okechukwu, MPA[u]

PEDIATRICS® Volume 151, number 2, February 2023 e2022060640

AAP 2023 RECOMMENDATION

Offer referral for adolescents **13 years and older** with **severe obesity** for evaluation for metabolic and bariatric surgery.

Age alone should not be the sole determinant.
Younger patients may be considered on a case-by-case basis.

Referral is for evaluation — not a commitment to surgery.

Do Patients Need to "Prove" They Can Lose Weight First?

Prior weight loss is NOT required for referral or consideration for metabolic surgery.

Children's National

ASMBS Pediatric Guidelines

SURGERY FOR OBESITY AND RELATED DISEASES
OFFICIAL JOURNAL OF THE AMERICAN SOCIETY FOR METABOLIC AND BARIATRIC SURGERY

ASMBS Position Statement

ASMBS pediatric metabolic and bariatric surgery guidelines, 2018

"There are no data that the number of weight loss attempts correlates with success after MBS... ***Prior attempts at weight loss should not be a barrier to definitive treatment."***

Zeller DM, Leonard JA, Stanford SB, et al.
Surg Obes Relat Dis. 2018;14(7):882–901.

Teen-LABS 2026

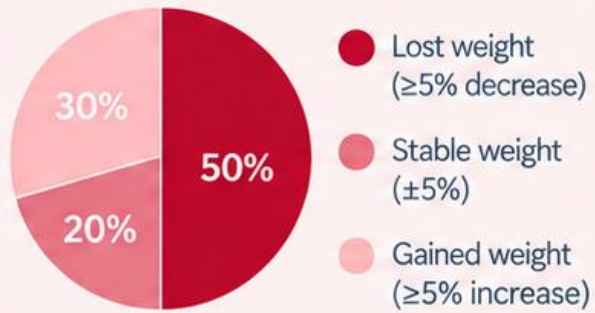
OBESITY
a research journal

THE OBESITY SOCIETY

Does preoperative weight change predict adolescent metabolic and bariatric surgery outcomes? Teen-LABS study

Leah L. M. Davis, PhD[1] | Thomas Inge, MD, PhD[2] | et al.
Obesity (Silver Spring). 2026;34:XXX–XXX.

Preoperative Weight Trajectory
(n = 123 adolescents)



Preoperative weight trajectory did not predict postoperative outcomes.

There were no significant differences in postoperative BMI reduction detween adolescents who lost, maintained, or gained weight preoperatively.

Davis LLM, Inge T, et al.
Obesity. 2026;34:XXX–XXX.

Severe pediatric obesity is a chronic disease — not a test of willpower.

The goal is to provide effective, evidence-based treatment, not to require proof of prior weight loss.

Why Refer Early?

Severe obesity is a progressive, chronic disease — waiting has consequences.

1 Obesity Progresses Over Time

Without effective treatment, BMI and comorbidities often worsen during childhood and adolescence.

Age 13
BMI 35
Class 2 obesity



"Let's keep working on lifestyle..."

Years pass

Obesity often progresses despite lifestyle treatment alone.

Age 15
BMI 50
Class 3 obesity



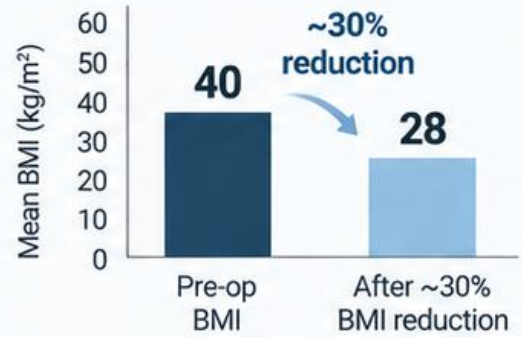
- Hypertension
- Type 2 diabetes (prediabetes)
- Obstructive sleep apnea
- MASLD
- Orthopedic disease (e.g., SCFE, Blount)

> "Obesity is a **chronic disease** that often **progresses** over time and is associated with the development of multiple, serious health conditions. **Early and intensive treatment is recommended.**"
>
> AAP Clinical Practice Guideline for the Evaluation and Treatment of Children and Adolescents With Obesity. *Pediatrics*. 2023;151(2):e2022060640.

2 Starting BMI Matters

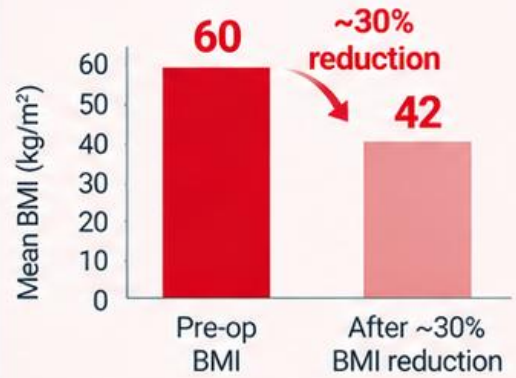
Bariatric surgery leads to substantial, proportionate weight loss, but patients with **higher preoperative BMI** often remain in the obesity range—even after successful treatment.

Earlier Intervention
Lower starting BMI



Often reaches overweight or near-normal range

Later Intervention
Higher starting BMI



Often remains in the obesity range

Same excellent response. Very different destination.

CNH Pediatric Bariatric Surgery Program (FY24–FY26, n=190)
Mean BMI reduction at 12 months: ~25–30% across BMI categories.

Why Refer Early?

Adolescents Achieve Greater Weight Loss Than Adults After Metabolic Surgery

Children's National

frontiers in Endocrinology

ORIGINAL RESEARCH
published: 08 March 2020
doi: 10.3389/fendo.2020.00157

Comparison of Short and Long-Term Outcomes of Metabolic and Bariatric Surgery in Adolescents and Adults

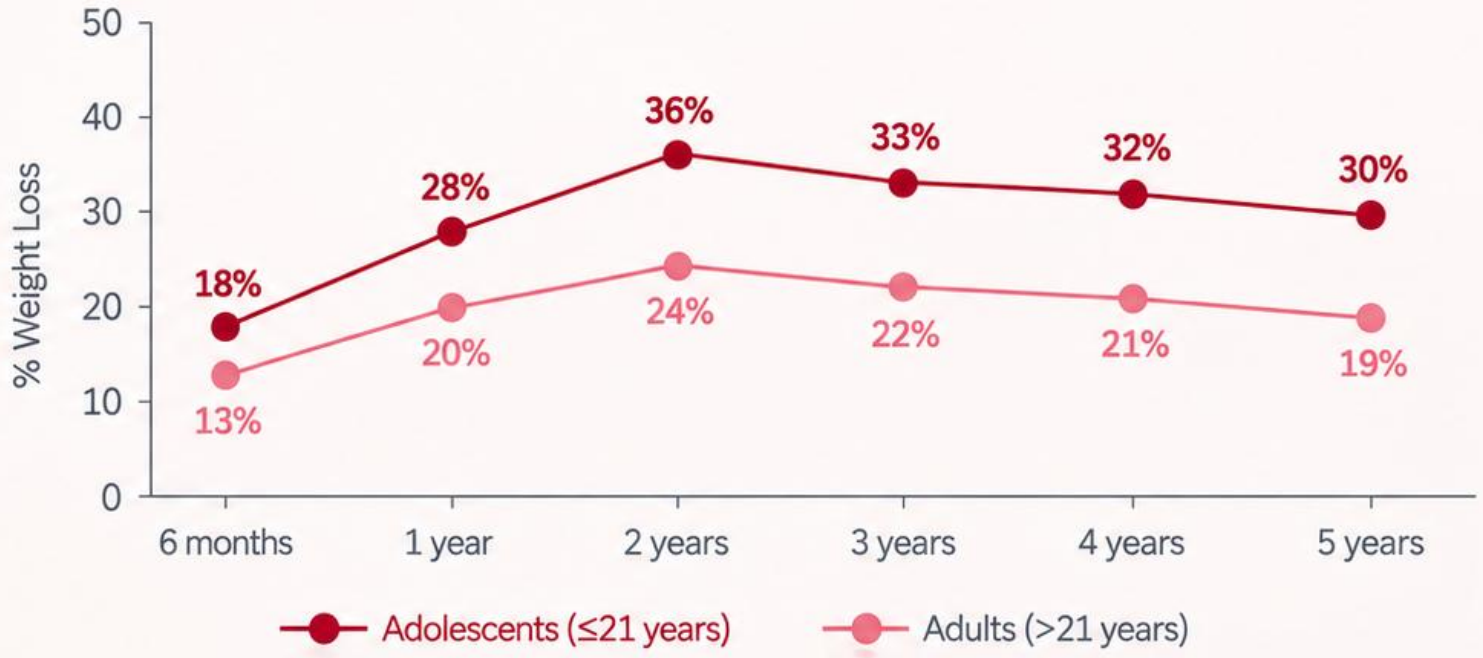
Fredric C. Stanford[1,2], Lisa A. Baker[1], Kimberley J. Brown[3], Saurabh Gupta[4], Melinda Ngo[1,5] and Thomas E. Inge[2]*

Front Endocrinol (Lausanne). 2020;11:157.

- Retrospective cohort study
- 76 adolescents (≤21 years) and 74 adults (>21 years)
- Sleeve gastrectomy or Roux-en-Y gastric bypass
- Compared weight loss up to 5 years
- Greater weight loss in adolescents after adjustment for procedure type, baseline weight, and race

Greater Percentage Weight Loss in Adolescents vs Adults

Mean % Weight Loss Over Time



Earlier treatment may be more effective treatment.

Adolescents achieve greater and more durable weight loss after metabolic surgery compared with adults, supporting the importance of timely referral and intervention.

What Happens After Referral?

A comprehensive, multidisciplimary evaluation

1 Bariatric Surgery Consultation

- Complete medical & surgical history
- Obesity trajectory
- Comorbidities
- Prior treatment attempts

No decision about surgery is made at referral.

2 IDEAL Clinic

Medical obesity clinic evaluation

- Obesity medicine and nutrition
- Lifestyle and behavioral support
- Medical therapy when appropriate
- Preparation for surgery when indicated

3 Psychological Evaluation

- Readiness and motivation
- Mental health assessment
- Expectations
- Family support
- Strategies for long-term success

4 Multidisciplinary Decision

- Review all evaluation findings
- Individualized treatment plan
- Ongoing support regardless of treatment path

Medical therapy • Surgery • Both
when clinically appropriate

Our Pediatric Bariatric Surgery Team



Mark Kovler, MD
Director, Bariatric Surgery Program
Pediatric Surgeon



Mikael Petrosyan, MD, MBA
Division Chief,
General & Thoracic Surgery
Pediatric Surgeon



Timothy Kane, MD
Emeritus Chief,
General & Thoracic Surgery
Pediatric Surgeon



Caitlin Sherman, NP
Clinical Program Coordinator
Bariatric Surgery



Eleanor Mackey, PhD
Director, Mental Health Services,
Bariatric Surgery
Psychologist

Referral begins a conversation — not a commitment to surgery.

Laparoscopic Sleeve Gastrectomy

Key Steps of the Operation

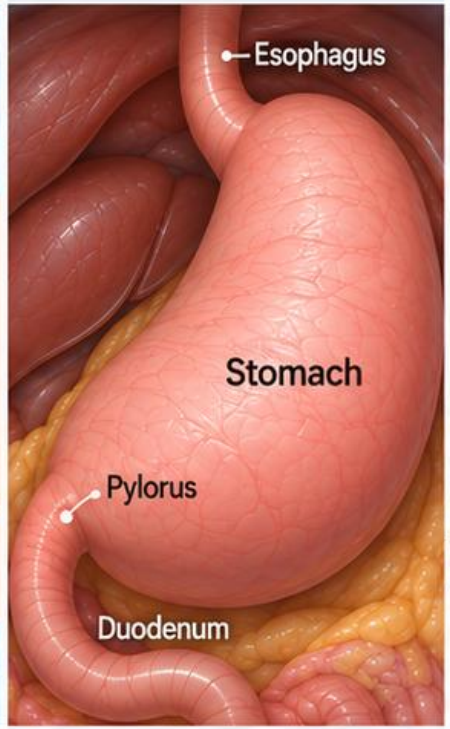
~75–80% of stomach removed
Pylorus preserved | No intestinal bypass
Minimally invasive (5 small incisions)

1 Laparoscopic Access



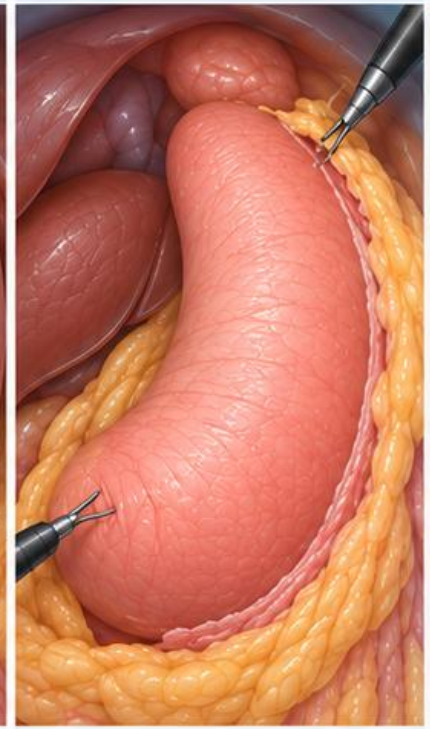
Five small incisions (ports) are placed in the abdomen, including one at the umbilicus.

2 Stomach Anatomy (Before)



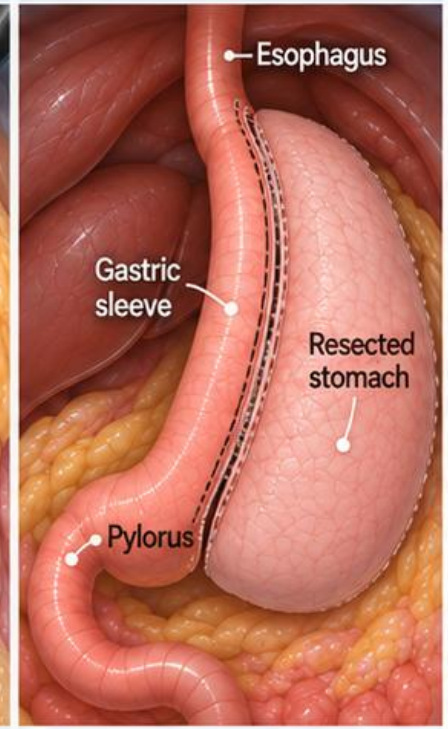
The stomach is visualized. The pylorus and intestinal continuity are preserved.

3 Mobilize Greater Curvature



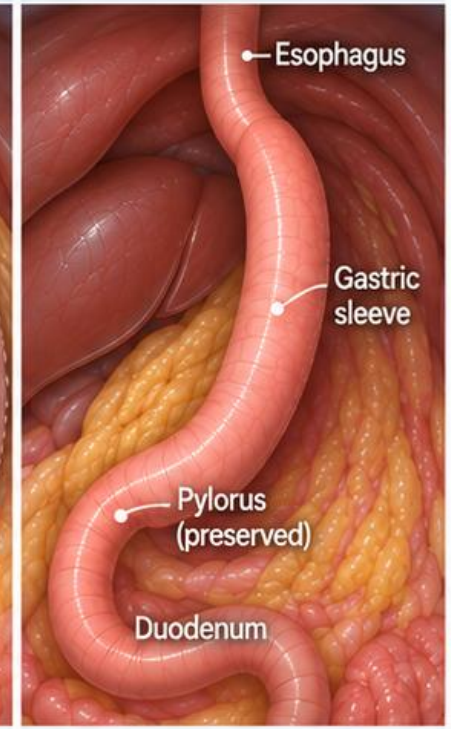
The greater curvature of the stomach is mobilized, separating the stomach from surrounding attachments.

4 Staple Line (Resection)



The stomach is divided along a calibrated staple line, starting in the antrum and continuing toward the angle of His, removing ~75–80% of the stomach.

5 Final Anatomy (Sleeve)



A narrow gastric sleeve remains. The pylorus is preserved and there is no intestinal bypass or rerouting.

6 Small Incisions



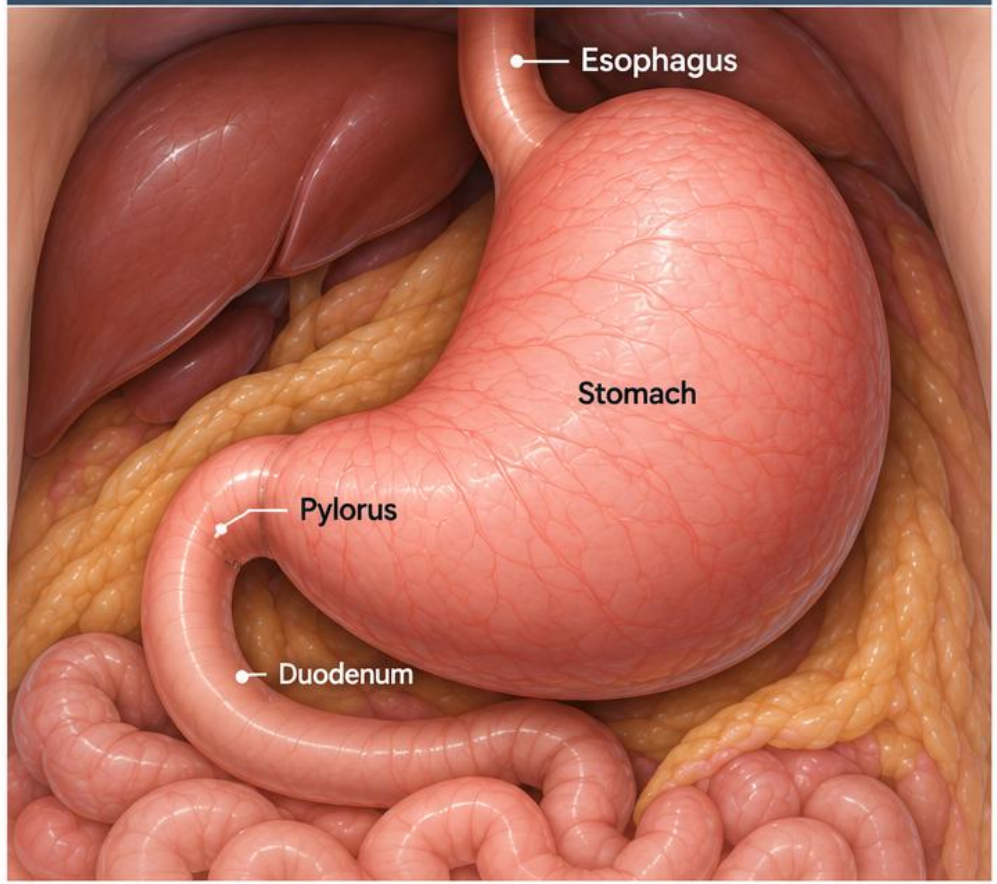
The operation is completed through 5 small incisions, typically resulting in minimal scarring.

Laparoscopic Sleeve Gastrectomy

Before and After

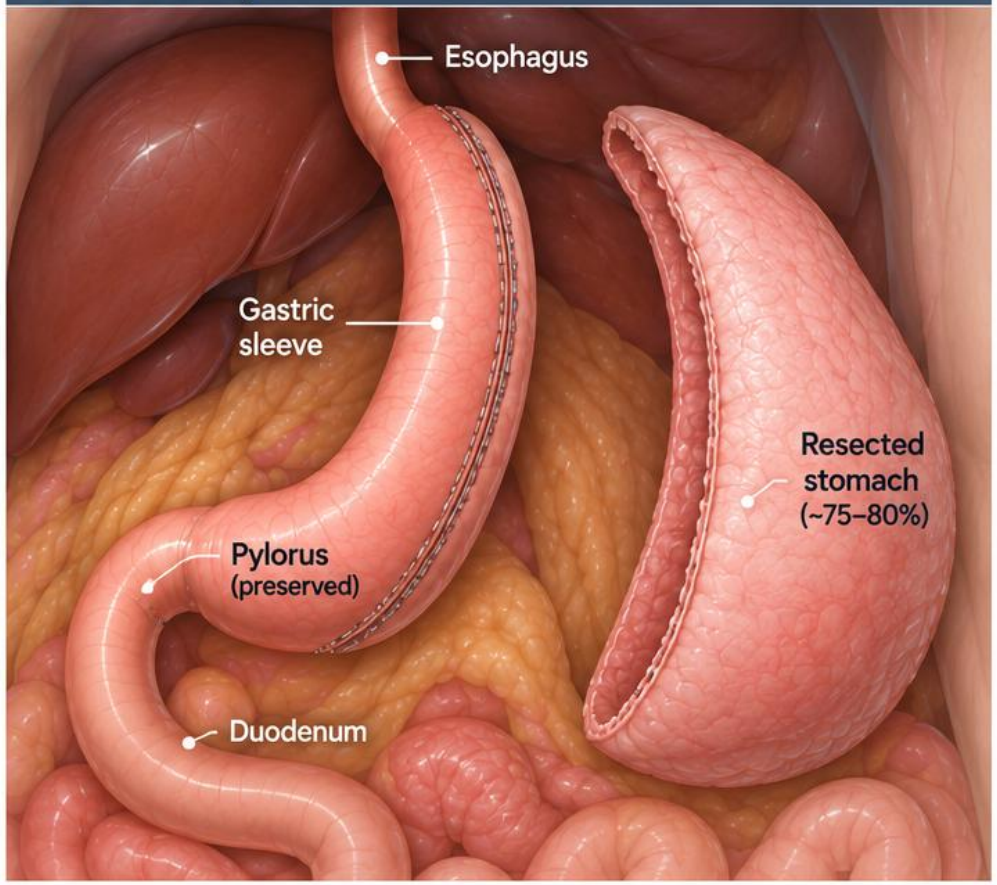
~75–80% of stomach removed
Pylorus preserved
No intestinal bypass
Minimally invasive (5 small incisions)

Before Surgery
Normal Stomach Anatomy



A larger stomach contributes to increased food intake and altered hunger signaling in obesity.

After Sleeve Gastrectomy
Final Anatomy



A narrow gastric sleeve remains, with the pylorus intact and normal intestinal continuity.

How Does Sleeve Gastrectomy Work?

A smaller stomach, different eating patterns, and powerful hormonal and metabolic effects

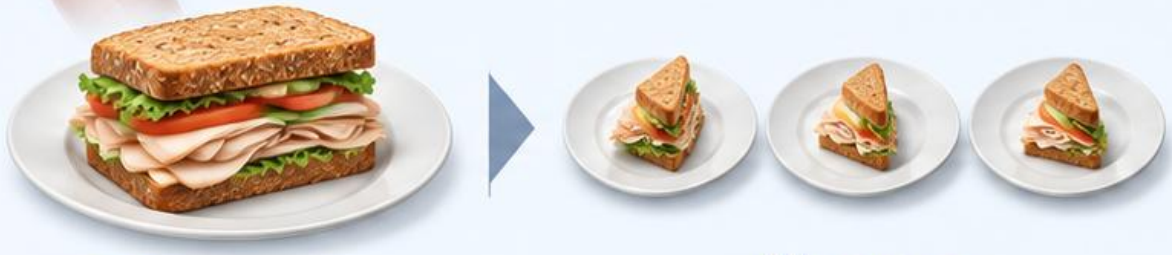
1 Reduced Capacity & Changed Eating Patterns



Smaller reservoir
Less food at one time

Earlier satiety
Feel full sooner

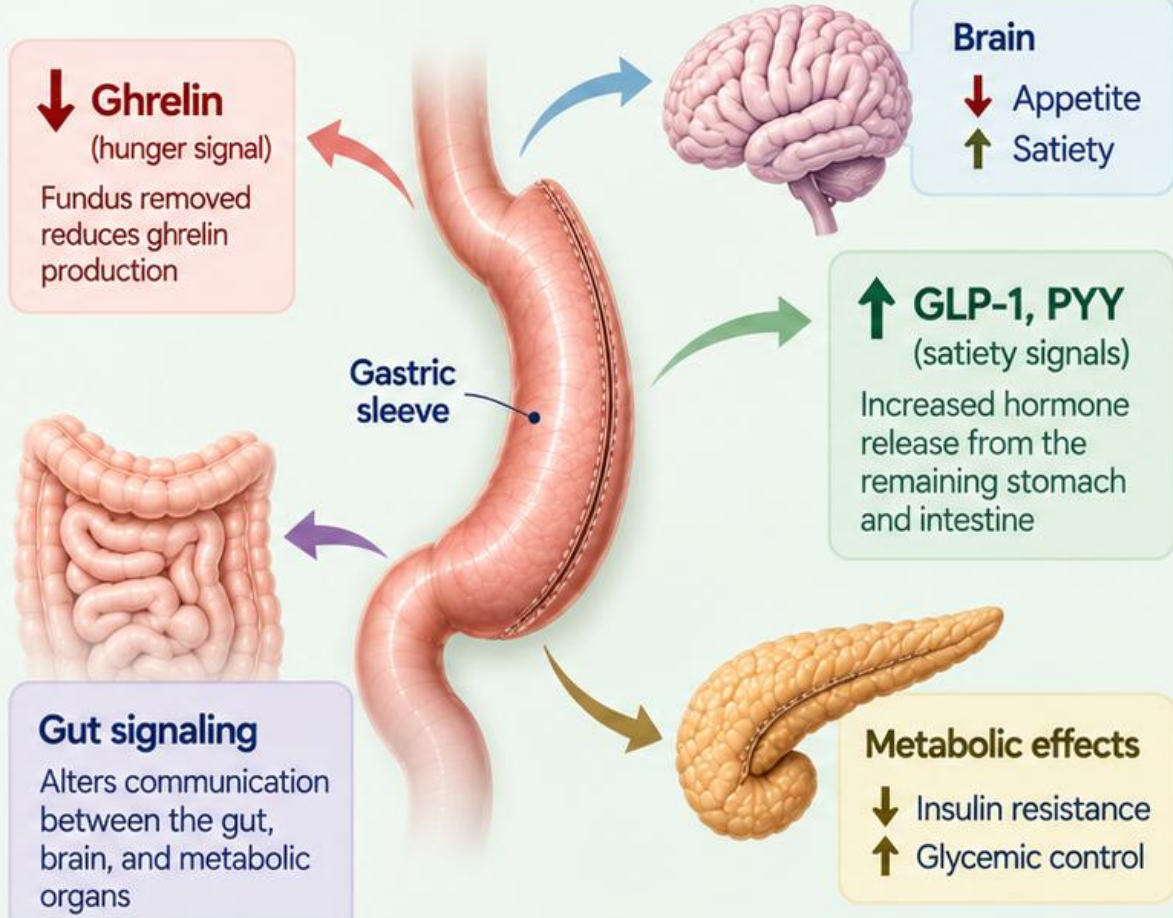
Changed eating patterns
Smaller, more frequent meals
Slower eating



Before surgery
Larger meals

After surgery
Smaller, more frequent meals

2 Hormonal & Metabolic Effects



Multiple complementary mechanisms lead to improved weight and metabolic health.

The First Year After Sleeve Gastrectomy

Children's National experience | FY24–FY26

Children's National

3 Months
(n = 94)

16.8%
BMI reduction

49 lb
average weight loss
(22.4 kg)

6 Months
(n = 89)

22.4%
BMI reduction

66 lb
average weight loss
(30.1 kg)

12 Months
(n = 82)

25.8%
BMI reduction

75 lb
average weight loss
(33.8 kg)



Early improvements in weight-related comorbidities

Type 2 diabetes / prediabetes
Improved glycemic control; remission in many patients

Hypertension
Lower blood pressure and decreased medication use

Obstructive sleep apnea
Improved symptoms and decreased need for CPAP

Metabolic dysfunction–associated steatotic liver disease (MASLD)
Improved liver enzymes and steatosis

Improvement often begins within **weeks** of surgery.

Durability of Weight Loss and Resolution of Comorbidities

The Teen-LABS Study – Long-term outcomes in adolescents

Children's National

The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 JANUARY 14, 2016 VOL. 374 NO. 2

Weight Loss and Health Status 3 Years after Bariatric Surgery in Adolescents

Inge TH et al. N Engl J Med. 2016;374:113-23.

Same prospective cohort. A decade of follow-up.

The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 OCTOBER 31, 2024 VOL. 391 NO. 17

Ten-Year Outcomes after Bariatric Surgery in Adolescents

Inge TH et al. N Engl J Med. 2024;391:1656-65.

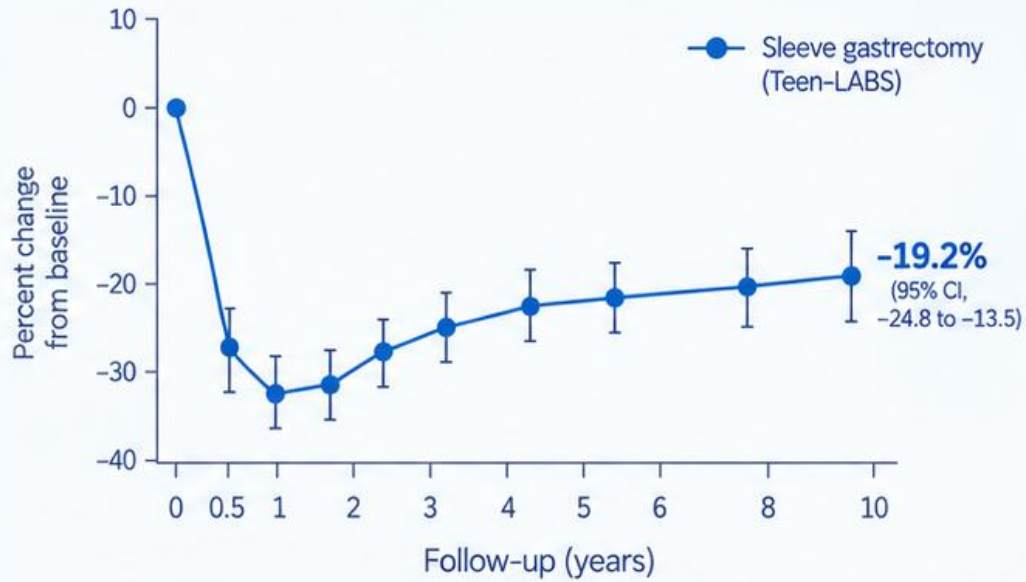
3-YEAR OUTCOMES
(NEJM 2016)

26%
mean weight loss
after sleeve gastrectomy
(mean BMI change, 26%; 95% CI, 22–30)

Remission of weight-related comorbidities at 3 years

Type 2 diabetes	95%
Hypertension	74%
Dyslipidemia	66%

Mean Percent Change in BMI from Baseline
Teen-LABS (sleeve gastrectomy)



10-YEAR OUTCOMES
(NEJM 2024)

20%
lower BMI than baseline
after sleeve gastrectomy
(mean BMI change, –19.2%; 95% CI, –24.8 to –13.5)

Remission of weight-related comorbidities at 10 years

Type 2 diabetes	55%
Hypertension	57%
Dyslipidemia	54%

Obesity Requires Multimodal, Longitudinal Treatment

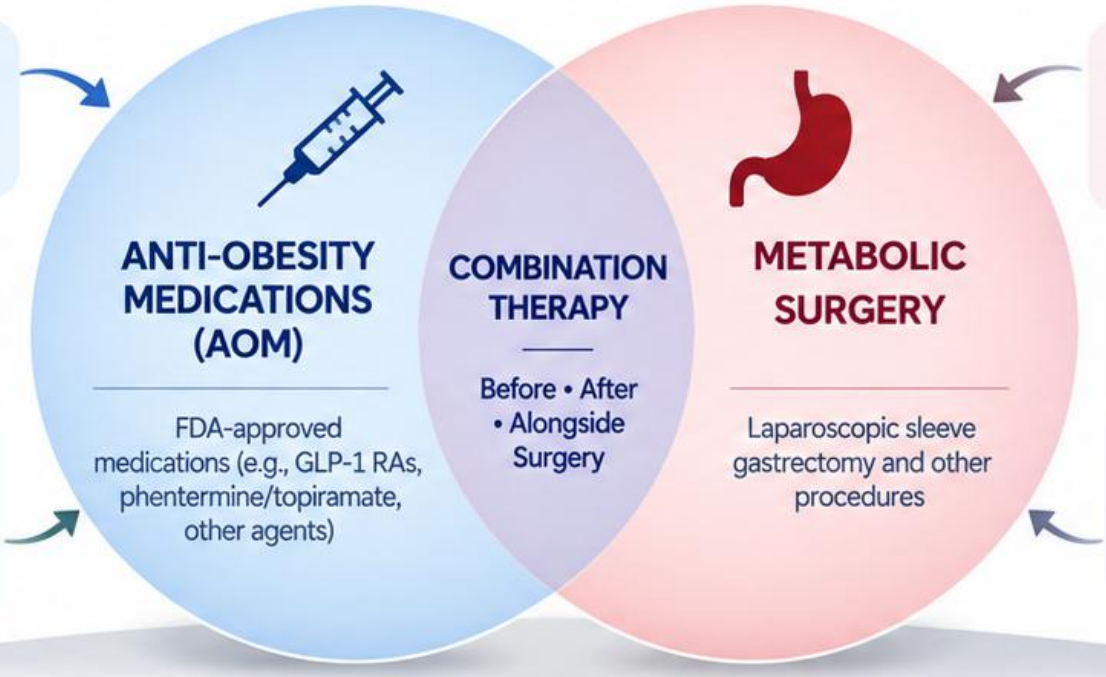
Children's National

Medication and surgery are complementary tools — not competing therapies.

Pediatric obesity is a chronic, relapsing disease that requires individualized, ongoing treatment.

Inadequate response to AOM
→ Consider surgery

Very severe obesity / high starting BMI
→ Combination therapy may be needed to achieve sufficient treatment effect



Inadequate response or weight recurrence after surgery
→ Add AOM

Good response to one modality
→ That modality alone may be sufficient

Lifestyle Counseling | Nutrition Support | Behavioral Health | Multidisciplinary Care

FOUNDATION FOR LIFELONG OBESITY CARE

AAP Clinical Practice Guideline (2023)

"Comprehensive obesity treatment should integrate intensive health behavior and lifestyle treatment with pharmacotherapy and metabolic/bariatric surgery when indicated."

Hampl et al. Pediatrics. 2023;151:e2022060640.

- Individualized care
- Adjusted over time
- Team-based approach

The goal is durable control of a chronic disease —
using the right treatment, or combination of treatments, for the **individual patient.**

Take-Home Messages

Children's National

1



Treat severe obesity early

Severe pediatric obesity is a chronic, progressive disease. Effective treatment should not be delayed.

2



Metabolic surgery works

For appropriately selected adolescents, metabolic surgery is safe, effective, and provides durable weight loss and improvement in obesity-related disease.

3



Think multimodal, not either/or

Surgery and anti-obesity medications are complementary tools within individualized, longitudinal obesity care.

Surgical Treatment of Pediatric Obesity

Mark L. Kovler, MD
Director of Pediatric and Adolescent Bariatric Surgery
Division of General & Thoracic Surgery
Children's National Hospital

Two Decades of Progress:
Advancing Pediatric Obesity Care
September 18, 2026

Children's National

Children's National
PEDIATRIC BARIATRIC SURGERY PROGRAM
HEALTHIER KIDS • BRIGHTER FUTURES

How to Claim CE Credit

1. Submit the **attendance code VASYEH** by:
   - Texting to **301-273-7643**, or
   - Entering **online** at ce.childrensnational.org/code
2. Complete the Evaluation
3. Download CE Certificate

Credit may be claimed up to 60 days from the date of the live event.

Psychosocial Considerations in Pediatric Metabolic and Bariatric Surgery

Eleanor Mackey, PhD | Children's National Hospital

Children's National

Continuing Education – Learner Notification

Two Decades of Progress: Advancing Pediatric Obesity Care
September 18th, 2026

Notice of Requirement for Successful Completion

Participants may earn CE credit for this activity by attending the entire education session and completing the required evaluation. Instructions for claiming CE credit, including the attendance code, will be provided at the conclusion of the activity.

Nurses: Children's National Hospital designates this live activity for a maximum of 5.0 ANCC contact hours for nurses. Nurses should claim only the credit commensurate with the extent of their participation in the activity.

Physicians: Children's National Hospital designates this live activity for a maximum of 5.0 AMA PRA Category 1 Credits™ for physicians. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Pharmacists: Children's National Hospital is accredited by the Accreditation Council for Pharmacy Education (ACPE) as a provider of continuing pharmacy education. This program meets ACPE criteria for 5.0 contact hours.

Psychologists: Continuing Education (CE) credits for psychologists are provided through the co-sponsorship of the American Psychological Association (APA) Office of Continuing Education in Psychology (CEP). The APA CEP Office maintains responsibility for the content of the programs. Children's National Hospital designates this live activity for a maximum of 5.0 CE credits (Instructional Level: Intermediate Learning).

IPCE: This activity was planned by and for the healthcare team, and learners will receive 5.0 Interprofessional Continuing Education (IPCE) credit for learning and change.

Relevant Financial Relationships

The planning committee and presenters have no relevant financial relationships with ineligible companies.

Financial and In-Kind Commercial Support

No financial nor in-kind commercial support was received for this education activity.

JOINTLY ACCREDITED PROVIDER™ INTERPROFESSIONAL CONTINUING EDUCATION

In support of improving patient care, Children's National Hospital is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team. Children's National Hospital Accreditation Provider# 4008362.

Why is understanding the psychosocial context important?

- Weighing risks and benefits of surgery is critical for families
- Understanding pre-existing risk factors which may affect outcomes of surgery are also essential for optimal support
- Families and medical teams need to know:
  - Are there any psychosocial risks or benefits of pursuing surgery?
  - Are there any factors which may present a barrier to optimal outcomes after surgery?

How do we answer these questions?

- Working group of psychologists across the country
- Scoping review of existing literature through 2025



ELSEVIER

Surgery for Obesity and Related Diseases ■ (2026) 1–9

SURGERY FOR OBESITY AND RELATED DISEASES

Review article

What we know and where to go: a scoping review of the psychosocial literature in youth undergoing metabolic and bariatric surgery

Sanita L. Ley, Ph.D.[a,*], Nancy T. Browne, M.S.[b], Meredith Dreyer Gillette, Ph.D.[c], Eleanor Mackey, Ph.D.[d], Stephanie Sogg, Ph.D.[e], Amy R. Beck, Ph.D.[f], Melissa Santos, Ph.D.[g], on behalf of the Clinical Issues Committee of the American Society for Metabolic and Bariatric Surgery

[a]*Division of Behavioral Medicine & Clinical Psychology, Cincinnati Children's Hospital Medical Center and Department of Pediatrics, University of Cincinnati College of Medicine, Cincinnati, Ohio*
[b]*Dr. Allen F. Browne, LLC, Falmouth, Maine*
[c]*Division of Behavioral Health, Children's Mercy Kansas City, University of Missouri-Kansas City School of Medicine, Kansas City, Missouri*
[d]*Children's National Hospital, George Washington University School of Medicine and Health Sciences, Washington, D.C.*
[e]*Massachusetts General Hospital Weight Center, Massachusetts General Hospital, Boston, MA and Harvard Medical School, Boston, Massachusetts*
[f]*ARB PHD, LLC, Kansas City, Missouri*
[g]*Department of Pediatric Psychology, Connecticut Children's and the University of Connecticut School of Medicine, Farmington, Connecticut*

Received 31 October 2025; accepted 24 January 2026

Children's National

Why do youth and families consider surgery?

- Health
- Quality of Life
- Emotional/Psychological
- Durability







Children's National

Quality of life is the clearest psychosocial benefit

- The most consistent gains involve physical comfort, social and family functioning, and weight- or appearance-related self-esteem.
- The largest gains often occur during the first one to two years.
- Many improvements persist for up to 10 years; mental health-specific gains are less consistent.

41 of 42

studies found at least some improvement

PHYSICAL • SOCIAL • SELF-ESTEEM

Children's National

Psychosocial complexity is common—not disqualifying

- Depression, anxiety, disordered eating, ADHD, and neurodivergence are common in youth with severe obesity.
- Having a diagnosis does not affect weight loss outcomes but can benefit from additional support.
- We assess needs, readiness, and supports—do not exclude based on diagnosis alone.

71%

met criteria for a psychiatric disorder

in one study of adolescents presenting for MBS



Children's National

Mental health usually improves or remains stable

- Depression and anxiety are among the most frequently studied concerns.
- 18 studies reported postoperative mood improvement; some also found reduced medication use.
- Many youth show little change, and a small subset experiences worsening symptoms.

The expected pattern

IMPROVE

or

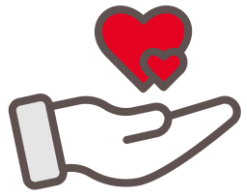
REMAIN STABLE

A smaller subset worsens

Children's National

Suicide risk requires monitoring

- Suicidal ideation appears to be usually stable, sometimes improved, and sometimes higher in youth undergoing MBS.
- Prior self-harm, poorer mental health, disordered eating, and substance use are more consistent predictors than surgery itself.
- Recommend identify baseline risk and monitor longitudinally.



Children's National

Disordered eating often improves—but trajectories vary

- Binge eating and loss-of-control eating are the most commonly reported preoperative concerns.
- Disordered eating is consistently associated with poorer psychosocial functioning.
- Relationship with postoperative weight outcomes is mixed.

Studies examining change after MBS*

9	3	2
improved	no change	worsened

*Patterns overlap across some studies

Assess and treat symptoms—do not assume ineligibility.

Children's National

Risk can emerge as adolescents become young adults

- Alcohol and tobacco use may increase over time for some youth.
- Risky behaviors tend to occur more often in youth who already have mental health challenges.
- Sexual activity rates are similar to what would be expected developmentally.
- These behaviors should be discussed and monitored after surgery, particularly in youth with existing psychosocial risks.

Support

- Families play a huge role in:
  - Deciding whether to pursue surgery
  - Supporting recovery
  - Helping with long-term lifestyle changes
- Family support appears important, but researchers still do not fully understand which aspects of family life help or hinder success.
- What constitutes "family" can look different and the role of peers in adolescents' and young adults' life is also important.

Youth with Neurodivergence

- Youth with neurodivergence, cognitive impairment, genetic syndromes, and other special healthcare needs remain understudied.
- 7 studies reported weight outcomes comparable with reference groups.
- Capacity, assent, caregiver support, and understanding the risks of both having and not having surgery require individualized evaluation.

Children's National

Postoperative Adherence

- Attendance decreases over time
- Vitamin and supplement adherence is challenging
- Better adherence is consistently associated with better outcomes
- Behavioral health support may be important for maintaining engagement

Transition to adulthood

- Patients often undergo MBS during a period of major developmental transition
- Independence increases while parental oversight decreases
- Transition readiness should be assessed
- Adult bariatric and behavioral health follow-up help

Assess. Support. Monitor. Don't exclude.

- High psychosocial burden before surgery
- Quality of life improves for most patients
- Mental health is generally stable or improved
- A subset remain vulnerable to psychological difficulties
- Monitor suicidality, substance use, and adherence
- Behavioral health should be integrated throughout care



Children's National

How to Claim CE Credit

1. Submit the **attendance code VASYEH** by:
   - Texting to **301-273-7643**, or
   - Entering **online** at ce.childrensnational.org/code
2. Complete the Evaluation
3. Download CE Certificate

Credit may be claimed up to 60 days from the date of the live event.

Pharmacotherapy in Pediatric Obesity: Updates and Practice



Susma Vaidya, MD, MPH, Diplomate of ABOM
Clinical Associate Professor of Pediatrics
Medical Director: IDEAL Clinic
Children's National Hospital

Children's National®

Continuing Education – Learner Notification

Two Decades of Progress: Advancing Pediatric Obesity Care
September 18th, 2026

Notice of Requirement for Successful Completion

Participants may earn CE credit for this activity by attending the entire education session and completing the required evaluation. Instructions for claiming CE credit, including the attendance code, will be provided at the conclusion of the activity.

Nurses: Children's National Hospital designates this live activity for a maximum of 5.0 ANCC contact hours for nurses. Nurses should claim only the credit commensurate with the extent of their participation in the activity.

Physicians: Children's National Hospital designates this live activity for a maximum of 5.0 AMA PRA Category 1 Credits™ for physicians. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Pharmacists: Children's National Hospital is accredited by the Accreditation Council for Pharmacy Education (ACPE) as a provider of continuing pharmacy education. This program meets ACPE criteria for 5.0 contact hours.

Psychologists: Continuing Education (CE) credits for psychologists are provided through the co-sponsorship of the American Psychological Association (APA) Office of Continuing Education in Psychology (CEP). The APA CEP Office maintains responsibility for the content of the programs. Children's National Hospital designates this live activity for a maximum of 5.0 CE credits (Instructional Level: Intermediate Learning).

IPCE: This activity was planned by and for the healthcare team, and learners will receive 5.0 Interprofessional Continuing Education (IPCE) credit for learning and change.

Relevant Financial Relationships

The planning committee and presenters have no relevant financial relationships with ineligible companies.

Financial and In-Kind Commercial Support

No financial nor in-kind commercial support was received for this education activity.

JOINTLY ACCREDITED PROVIDER™ INTERPROFESSIONAL CONTINUING EDUCATION

In support of improving patient care, Children's National Hospital is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team. Children's National Hospital Accreditation Provider# 4008362.

Financial Disclosure

The presenter has no financial conflicts of interest to disclose.

Off-label use of medications to treat obesity where no approved/affordable alternatives exist will be discussed.

Objectives

1. Compare available medications and their efficacy in pediatric obesity
2. Apply clinical reasoning to choose and implement pharmacotherapy
3. Analyze a clinical scenario in pediatric obesity management

When is it time to use medication to treat obesity?

Lifestyle interventions have been ineffective in the following populations:

- Patients with a BMI diagnostic of Class II or III obesity
- Class I obesity and a significant obesity related complication, binge eating, or hyperphagia

Foundation of Medication Use in Obesity Treatment

No current evidence supports weight loss medication use as monotherapy; thus, PHCPs who prescribe weight loss medication to children should provide or refer to intensive behavioral interventions for patients & families as an adjunct to medication therapy.

- 2023 AAP Clinical Practice Guidelines

Off-Label Weight Management Medications

- **Metformin**: biguanide
  - PCOS
  - Adjunctive therapy with atypical antipsychotics
  - Prediabetes
- **Topiramate**: anticonvulsant
  - Limited data of efficacy in pediatric obesity
- **Lisdexamfetamine (Vyvanse)**: stimulant

Lisdexamfetamine

- **Mechanism:** Blocks reuptake of norepinephrine and dopamine into presynaptic neurons and increases release into the extra neuronal space
- **FDA approved indication:**
  - ≥ 6 years of age with ADHD
  - ≥18 years of age for binge eating
- **Off label use:** Loss of control with food, sneaking, impulsivity with food, often useful in undiagnosed ADHD

Lisdexamfetamine: BMI Reduction

- Limited data on BMI reduction in obesity
- Recent retrospective study demonstrated clinically significant BMI reduction in children with obesity and ADHD
  - **11.2% decrease in BMI % of the 95%** in those with Class 2 obesity
  - **11.1% decrease in BMI % of the 95%** in those with Class 1 obesity
- Anecdotal experience: more effective in children with concomitant ADHD

Salama M et al. ,*Pediatr Obes,* 2025

Lisdexamfetamine

- **Dosing:** Start **10 mg to 30 mg** and titrate to effect, can add topiramate or a small dose of stimulant in afternoon to help with full day control
- **Monitoring:** Follow every 1-2 months and titrate up by 10 mg to a maximum of 70 mg
- **Adverse effects:** Headaches, increase in anxiety, irritability, trouble with sleep onset, rebound hyperphagia
- **Caution:** HTN, congenital heart disease, arrythmia, anxiety

FDA Approved Weight Management Medications

- Phentermine
- Phentermine-topiramate
- GLP-1 receptor agonists
  - Liraglutide
  - Semaglutide
  - Tirzepatide

Phentermine

- **Mechanism:** Stimulates norepinephrine release in the hypothalamus, raises resting energy expenditure
- **FDA approved indication:** ≥ 17 years of age for weight management for 12 weeks
- **Off label use:** Younger adolescents to manage obesity, use for longer than 12 weeks

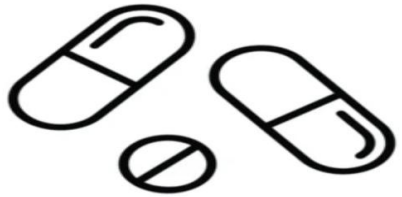
Phentermine: BMI Reduction

- Limited pediatric data
- Retrospective adolescent study
  - **10.9% decrease in BMI % of the 95%** at 6 months
  - Response decreased at 12 months
- **Tolerance can develop rapidly**

Bomberg EM, et al, *Pediatr Obes*. 2024.

Phentermine

- **Dosing:** 4 mg to 37.5 mg daily
- **Monitoring:** Blood pressure, heart rate
- **Adverse effects:** Anxiety, HTN, palpitations, dry mouth
- **Contraindication:** Uncontrolled HTN, congenital heart disease, arrythmia, anxiety, history of substance use
- **Caution:** SSRIs, other stimulant use



Phentermine and Topiramate: BMI Reduction

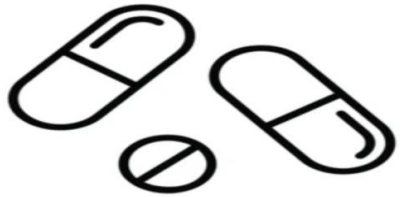
56-week randomized double-blinded trial with adolescents 12 to <18 years of age who received lifestyle counseling:

- **10.4 % decrease in BMI** compared to placebo in top-dose combination
- **8.1% decrease in BMI** compared with placebo in mid-dose combination
- Improved triglyceride and HDL in treated patients

Kelly, A. et al. NEJM. 1(6), 2022.

Phentermine and Topiramate

- **Monitoring:** BP, HR, height, pregnancy test, creatinine, bicarbonate
- **Adverse effects:** Paresthesia, dizziness, insomnia, depression, teratogenicity
- **Contraindication:** Pregnancy, glaucoma, hyperthyroidism, history of substance use
- **Caution:** CAD, history of arrythmia, HTN, SSRIs



Dosage Escalation Schedule: Phentermine-Topiramate

	Qsymia/Generic	Phentermine	Topiramate	
Weeks	**Daily Dose**	**Daily Dose**	**Daily dose**	
2 weeks	3.75 mg/23 mg	4 mg	25 mg	
12 weeks	7.5 mg/46 mg	8 mg	25 mg to 50 mg	Increase if at least 3% BMI reduction not achieved
2 weeks	11.25 mg /69 mg	18.75 mg	50 mg to 100 mg	
12 weeks	15 mg /92 mg	37.5 mg	100 mg	Discontinue if at least 5% BMI reduction not achieved

Glucagon-like Peptide-1 Receptor Agonists

- **Mechanism:**
  - Decrease hunger by slowing gastric emptying and targeting satiety in hypothalamus and neural pathways which provide pleasure with food
  - Increases insulin secretion and decreases glucagon secretion

- **FDA approved indication:** ≥ 12 years of age and older with obesity

GLP-1 Agonists

- **Adverse effects: Nausea, constipation, vomiting, abdominal pain**, headache, dizziness, fatigue, cholelithiasis and cholecystitis
- **Minimize side effects:** Aim for lowest effective dose, choose smaller food portions, avoid greasy, spicy, rich foods, drink plenty of water, can use ondansetron with dose escalation
- **Contraindication:** Personal or family history of medullary thyroid cancer, Multiple Endocrine Neoplasia syndrome type 2
- **Caution:** Pancreatitis, renal impairment, insulin use

Liraglutide : BMI Reduction

56-week randomized double-blind placebo-controlled trial with lifestyle counseling with a 26-week follow-up period in adolescents 12 to <18 years of age:

- **4.6 %** decrease in BMI compared to placebo
- **4.5 kg** absolute decrease in body weight
- No difference in cardiometabolic variables and quality of life measures between placebo and treatment arm

Kelly, AS, et al. NEJM 382(22), 2020.

Liraglutide : BMI Reduction

56-week randomized double-blind placebo-controlled trial with lifestyle counseling with a 26-week follow-up period in children 6 to < 12 years of age

- **7.4 %** decrease in BMI compared to placebo
- **6.0 kg** decrease in body weight compared to placebo
- Improvement in HbA1c and diastolic blood pressure

Fox, CK. et al. NEJM, 2025.

Liraglutide Dose Escalation

Weeks	Daily Dose	
1	0.6 mg	
2	1.2 mg	
3	1.8 mg	
4	2.4 mg	
5	3.0 mg	Maintenance dose



Semaglutide : BMI Reduction

68-week double-blind placebo-controlled trial with lifestyle counseling in adolescents 12 to <18 years of age:

- **16.7%** decrease in BMI compared to placebo
- **15.3 kg** absolute change in body weight
- **44.9%** in semaglutide group achieved normal BMI or overweight BMI
- Improvement in lipids, waist circumference, ALT, HbA1c, and quality of life measures

Weghuber, D., et al. NEJM. 2022. Kelly et. Obesity. 2023

Semaglutide Dose Escalation

Weeks	Weekly Dose	
1-4	0.25 mg	
5-8	0.5 mg	
9-12	1 mg	
13-16	1.7 mg	Maintenance dose
17 and on	2.4 mg	Maintenance dose



Additional FDA Approved Indications

- Reduce risk of major cardiovascular event in adults with cardiovascular disease and obesity/overweight
- Treat noncirrhotic metabolic dysfunction-associated steatohepatitis (MASH) with moderate-to-advanced liver fibrosis (stages F2–F3) in adults

Oral Semaglutide: Weight Reduction

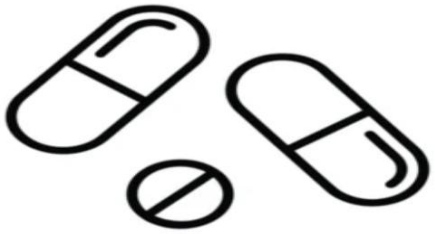
71-week double-blind placebo-controlled trial with lifestyle counseling in adults with obesity or overweight with a complication

- **11.4%** decrease in weight compared to placebo
- 50% of patients with a decrease in body weight of 15% or more
- Improved HbA1c, fasting insulin, triglyceride

Wharton et al. NEJM, 2025

Semaglutide: Oral

- FDA approved for adults
- Changing from injection to pills
    - Discontinue 2.4 mg injection and start pills after one week
    - Take Wegovy tablets in the morning on an empty stomach with no more than 4 ounces of water
    - After 30 minutes can eat or take other medications



Semaglutide Tablet Escalation

Days	Daily Dose	
1-30	1.5 mg	
31-60	4 mg	
61-90	9 mg	
91- onward	25 mg	Maintenance dose

Tirzepatide

- **Mechanism:** Glucose-dependent insulinotropic polypeptide (GIP) receptor agonist and a GLP-1 agonist

- **FDA approved indication:** ≥ 18 years of age and older with obesity, or overweight and a comorbidity, or moderate to severe OSA and obesity



Tirzepatide: Weight Reduction

72-week randomized double-blind placebo-controlled trial with lifestyle counseling in adults with obesity

- **15%** weight decrease with 5 mg dose
- **19.5 %** weight decrease with 10 mg dose
- **20.9%** weight decrease with 15 mg dose
- Improvement in waist circumference, blood pressure, insulin, lipids, prediabetes

Jastreboff, A. et al. NEJM, 2022

Case Study

14-year-old with escalated weight gain over the course of the pandemic

History:

- Strong family history of obesity
- Daily loss of control with foods
- Bullying in school, significant anxiety
- Snoring

Physical Exam: BMI: 44.61

- Pharynx: Mallampati II
- Neck: Circumferential hyperpigmentation (Grade IV)

Fasting Labs

- Normal glucose
- Elevated ALT
- Lipid panel: Normal with mild elevation of LDL
- Elevated insulin
- Prediabetes (6.1)
- Low vitamin D

Diagnoses

- Class 3 obesity
- Acanthosis
- Possible OSA
- Prediabetes
- Moderate insulin resistance
- Disordered eating
- Possible MASLD
- Anxiety/Mood concern

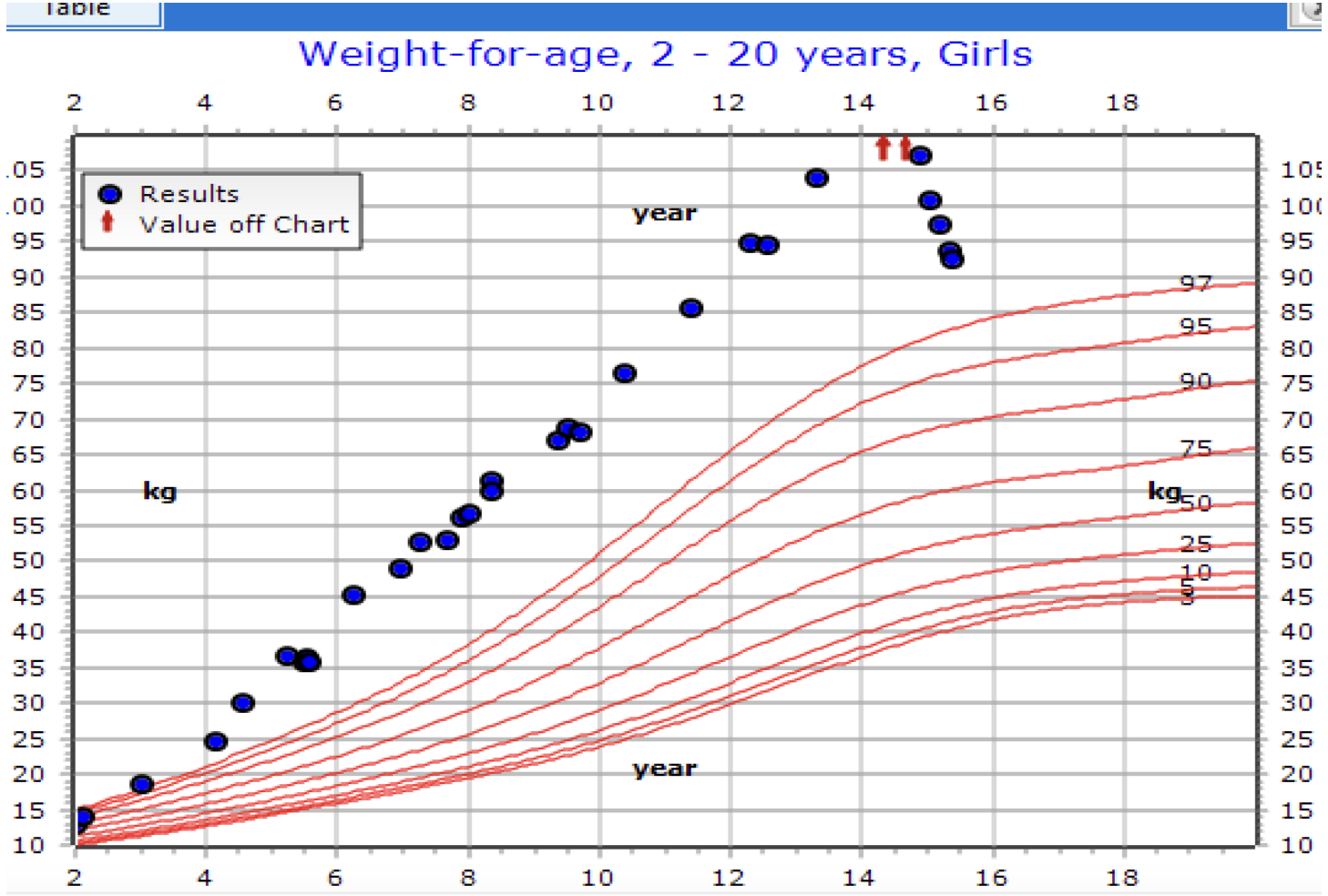
Treatment

- Dietary modifications and increase in physical activity
- Refer to psychology
- Medications:
  - Metformin
  - Vyvanse
  - GLP-1 agonists (semaglutide, liraglutide)
  - Phentermine and topiramate (4 mg phentermine/25 mg of topiramate)
- Sleeve gastrectomy

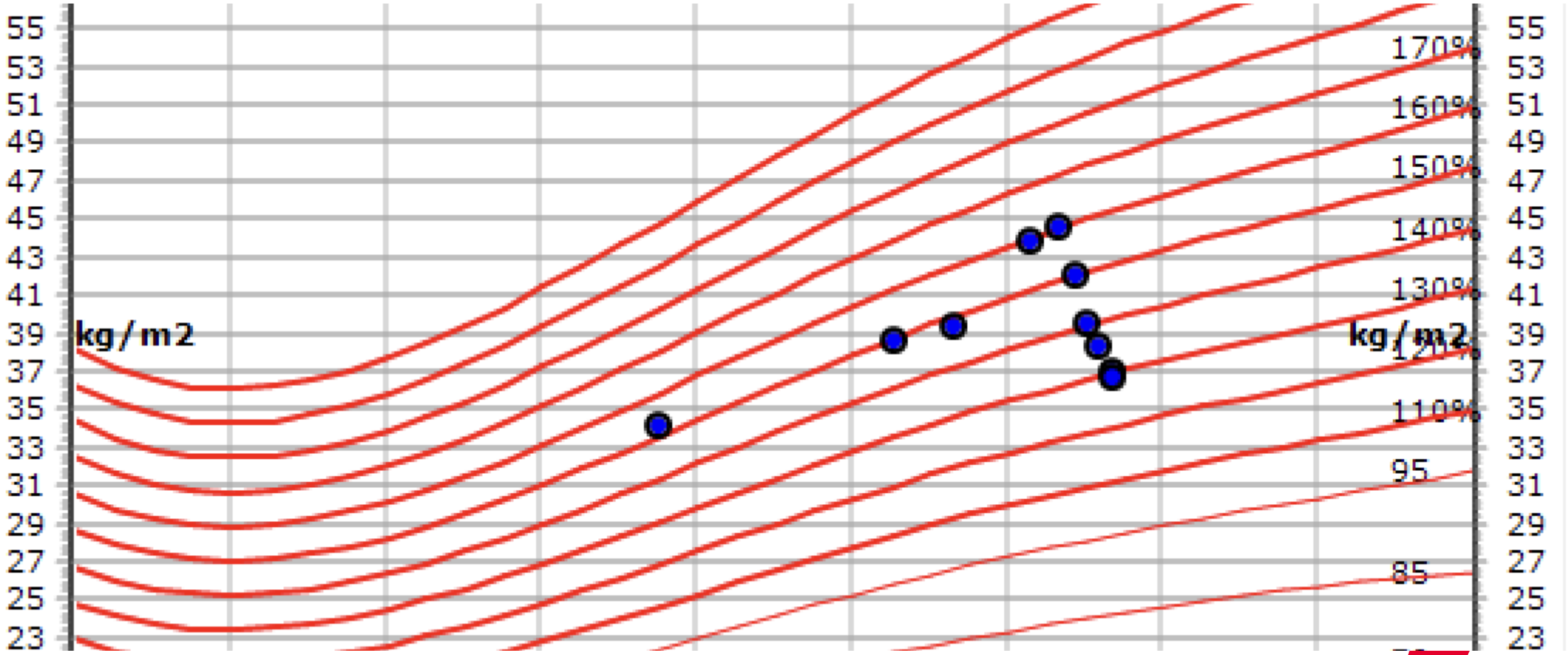
Treatment

- Dietary modifications and increase in physical activity
- Medications:
  - Metformin
  - Vyvanse
  - GLP-1 agonists (semaglutide, liraglutide)
  - **Phentermine and topiramate (8 mg phentermine/25 mg of topiramate)**
- Sleeve gastrectomy

Growth Chart



Obesity Growth Chart



Treatment Response: 9 months

- Weight reduction **21.6 kg**
- BMI reduction: **7.89 points**
- HbA1c and ALT normalized
- Snoring resolved
- Improved mood
- Good appetite control

Updates

- Missed multiple appointments
- Parent reached out because of decreasing efficacy of medication
- In the office: BMI had plateaued
- Options: Can increase dose
  - Phentermine 18.75 mg
  - 50 mg topiramate

Resources

- www.obesityaction.org
- https://pedsendo.org/clinical-resource/anti-obesity-medication-guideline/
- https://www.childrensnational.org/get-care/departments/obesity-program
- https://pediatrichealthnetwork.org/wp-content/uploads/2023/08/Algorithm-for-Managing-Obesity-in-Patients-ages-2-to-18.pdf

How to Claim CE Credit

1. Submit the **attendance code VASYEH** by:
   - Texting to **301-273-7643**, or
   - Entering **online** at ce.childrensnational.org/code
2. Complete the Evaluation
3. Download CE Certificate

Credit may be claimed up to 60 days from the date of the live event.

From Weight Gain to Vision Loss: A Primary Care Approach to IIH in the GLP-1 Era

Mrinmayee Takle, MD
Child Neurology Attending Physician
September 18, 2026



Children's National

Continuing Education – Learner Notification

Two Decades of Progress: Advancing Pediatric Obesity Care
September 18th, 2026

Notice of Requirement for Successful Completion

Participants may earn CE credit for this activity by attending the entire education session and completing the required evaluation. Instructions for claiming CE credit, including the attendance code, will be provided at the conclusion of the activity.

Nurses: Children's National Hospital designates this live activity for a maximum of 5.0 ANCC contact hours for nurses. Nurses should claim only the credit commensurate with the extent of their participation in the activity.

Physicians: Children's National Hospital designates this live activity for a maximum of 5.0 AMA PRA Category 1 Credits™ for physicians. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Pharmacists: Children's National Hospital is accredited by the Accreditation Council for Pharmacy Education (ACPE) as a provider of continuing pharmacy education. This program meets ACPE criteria for 5.0 contact hours.

Psychologists: Continuing Education (CE) credits for psychologists are provided through the co-sponsorship of the American Psychological Association (APA) Office of Continuing Education in Psychology (CEP). The APA CEP Office maintains responsibility for the content of the programs. Children's National Hospital designates this live activity for a maximum of 5.0 CE credits (Instructional Level: Intermediate Learning).

IPCE: This activity was planned by and for the healthcare team, and learners will receive 5.0 Interprofessional Continuing Education (IPCE) credit for learning and change.

Relevant Financial Relationships

The planning committee and presenters have no relevant financial relationships with ineligible companies.

Financial and In-Kind Commercial Support

No financial nor in-kind commercial support was received for this education activity.

JOINTLY ACCREDITED PROVIDER™ INTERPROFESSIONAL CONTINUING EDUCATION

In support of improving patient care, Children's National Hospital is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team. Children's National Hospital Accreditation Provider# 4008362.

Disclosures

- I have no financial interests or relationships to disclose

Objectives

1) Recognize the epidemiologic and mechanistic link between obesity and IIH, and identify at-risk patients
2) Identify the clinical features and vision-threatening course of IIH that mandate urgent evaluation and referral
3) Describe the evidence-based, weight-centered treatment approach, including the emerging role of GLP-1 receptor agonists

Epidemiology and presenting features

- More than 95% of adult patients with IIH are women of childbearing age with obesity
- Obesity rates in pediatric IIH vary by age: approximately 31% in children ≤12 years versus 69% in those ≥13 years
- Prevalence: 1 in 500 women with a BMI > 30
- History of recent weight gain precedes the onset of symptoms
- Headache is the most common initial symptom (reported in 84% of patients)
  - Other symptoms: transient visual obscurations (in 68% of affected patients), neck or back pain (in 53%), pulse synchronous tinnitus (in 52%), visual loss (in 32%), diplopia (in 18%), or Asymptomatic (25%)

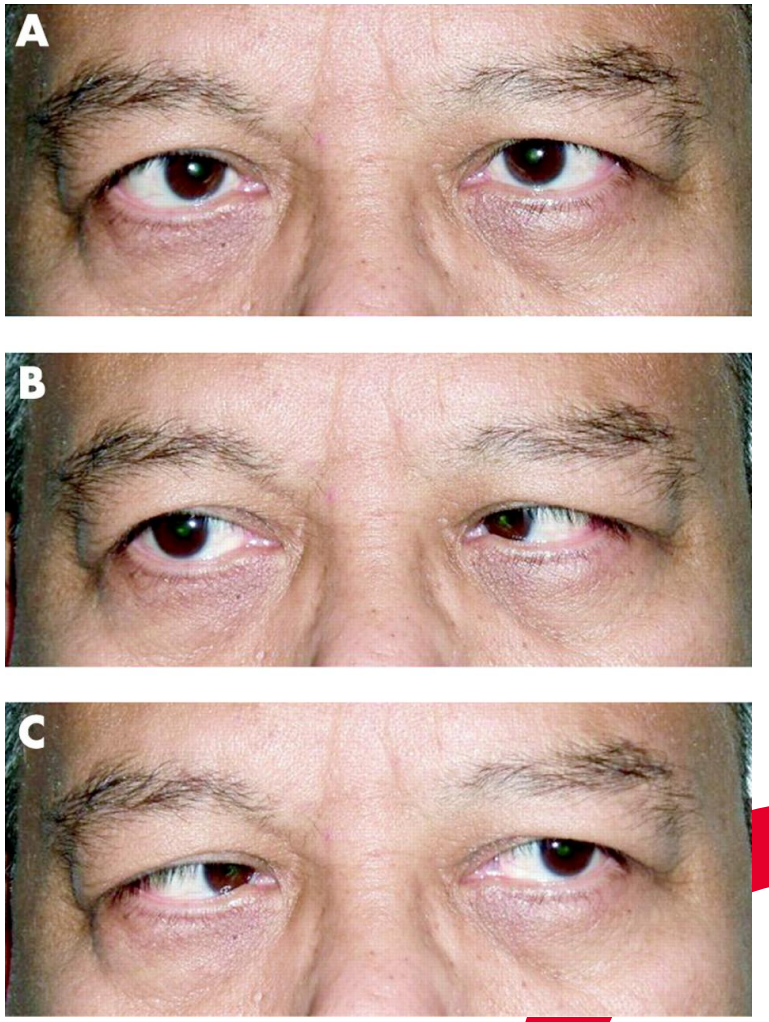
Wall M, Kupersmith MJ, Kieburtz KD, et al. The idiopathic intracranial hypertension treatment trial: clinical profile at baseline. *JAMA Neurol* 2014;71:693-701.
Agraz D, Morgan LA, Fouzdar Jain S, Suh DW. Clinical features of pediatric idiopathic intracranial hypertension. Clin Ophthalmol. 2019 May 24;13:881-886. doi: 10.2147/OPTH.S183087. PMID: 31213758; PMCID: PMC6538838.
Miah L, Strafford H, Fonferko-Shadrach B, et al. Incidence, prevalence, and health care outcomes in idiopathic intracranial hypertension: a population study. *Neurology* 2021;96(8):e1251-e1261.
Ko MW, Chang SC, Ridha MA, et al. Weight gain and recurrence in idiopathic intracranial hypertension: a case-control study. *Neurology* 2011;76:1564-1567.

When to Refer (to Ophthalmology and/or Neurology)

- **Papilledema is seen or suspected on fundoscopy**
- **Fundoscopy cannot be adequately performed or is equivocal**
- **Any visual symptom** (transient visual obscurations, diplopia, blurring, or subjective field/acuity loss)
- **Ongoing surveillance for vision loss**
- **Persistent, progressive, or new-onset headache** (with pulsatile tinnitus, nausea/vomiting, or with significant recent weight gain)
- **Any focal neurologic deficit, altered consciousness, or cranial neuropathy** (6^{th} nerve palsy, etc)
- **Confirmatory workup and treatment** (coordination of MRI/MRV, lumbar puncture with opening pressure, initiation of ASMs)

Ocular Findings – Papilledema & CN VI Palsy





Horton JC. Idiopathic Intracranial Hypertension. N Engl J Med. 2025 Oct 9;393(14):1409-1419. doi: 10.1056/NEJMra2404929. PMID: 41061234.
Steele H, Aram J, Wilhelm T, *et al* Not a microvascular sixth nerve palsy *Practical Neurology* 2007;**7:**400-404.

Core Diagnostic Criteria

Table 1 *Modified Dandy criteria*[2]

1. Signs and symptoms of increased intracranial pressure (headaches, nausea, vomiting, transient obscurations of vision, papilledema).
2. No localizing neurologic signs otherwise, with the single exception being unilateral or bilateral VI nerve paresis.
3. CSF can show increased pressure, but no cytologic or chemical abnormalities otherwise.
4. Normal to small symmetric ventricles must be demonstrated (originally required ventriculography, but now demonstrated by CT).

Table 2 *Criteria for diagnosing idiopathic intracranial hypertension*

1. If symptoms present, they may only reflect those of generalized intracranial hypertension or papilledema.
2. If signs present, they may only reflect those of generalized intracranial hypertension or papilledema.
3. Documented elevated intracranial pressure measured in the lateral decubitus position.
4. Normal CSF composition.
5. No evidence of hydrocephalus, mass, structural, or vascular lesion on MRI or contrast-enhanced CT for typical patients, and MRI and MR venography for all others.
6. No other cause of intracranial hypertension identified.

Friedman DI, Jacobson DM. Diagnostic criteria for idiopathic intracranial hypertension. Neurology. 2002 Nov 26;59(10):1492-5. doi: 10.1212/01.wnl.0000029570.69134.1b. PMID: 12455560.

ICHD3: 7.1.1 Headache attributed to idiopathic intracranial hypertension (IIH)

Previously used terms:

Headache attributed to benign intracranial hypertension (BIH); pseudotumor cerebri; meningeal hydrops; serous meningitis.

Description:

New headache, or a significant worsening of a pre-existing headache, caused by and accompanied by other symptoms and/or clinical and/or neuroimaging signs of idiopathic intracranial hypertension (IIH), with typical features suggestive of IIH.

Diagnostic criteria:

A. New headache, or a significant worsening[1] of a pre-existing headache, fulfilling criterion C
B. Both of the following:
    1. idiopathic intracranial hypertension (IIH) has been diagnosed[2]
    2. cerebrospinal fluid (CSF) pressure exceeds 250 mm CSF (or 280 mm CSF in obese children)[3]
C. Either or both of the following:
    1. headache has developed or significantly worsened1 in temporal relation to the IIH, or led to its discovery
    2. headache is accompanied by either or both of the following:
        a) pulsatile tinnitus
        b) papilloedema[4]
D. Not better accounted for by another ICHD-3 diagnosis[5,6].

https://ichd-3.org/7-headache-attributed-to-non-vascular-intracranial-disorder/7-1-headache-attributed-to-increased-cerebrospinal-fluid-pressure/7-1-1-headache-attributed-to-idiopathic-intracranial-hypertension-iih/

“Secondary” Intracranial Hypertension

- Medications
  - Tetracycline antibiotics
  - Retinoids
  - Lithium
- Infections
  - Lyme!

- Tumor
- Increased CSF secretion
- Blockage of CSF absorption
- Blockage of ventricular system
- Obstruction of venous outflow

Biousse V, Newman NJ. Diagnosis and Clinical Features of Common Optic Neuropathies. Lancet Neurol. 2016;15(13):1

Workup

MRI and MRV

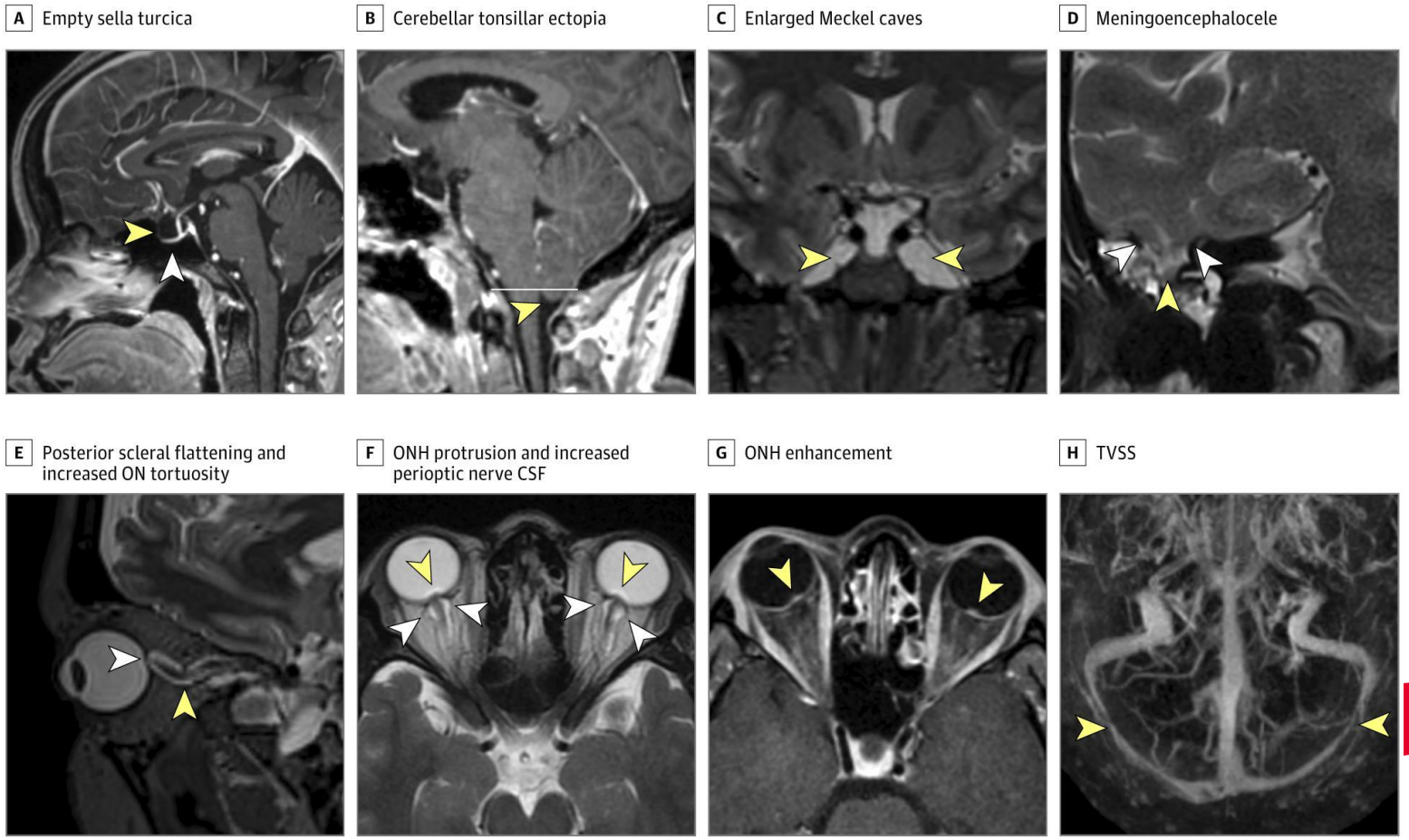
LP with opening pressure

Ophthalmologic exam

- Dilated fundus exam
- Visual field testing
- OCT

Imaging Findings

- Partially empty sella turcica – 60%
- Acquired cerebellar tonsillar ectopia – 20%
- Optic nerve tortuosity – 40%
- Posterior globe flattening – 60%
- Optic nerve head protrusion – 30%
- Transverse sinus stenosis – 80%
- Optic nerve sheath distension – 70%
- Slit-like ventricles – 15%



Chen BS, Meyer BI, Saindane AM, Bruce BB, Newman NJ, Biousse V. Prevalence of Incidentally Detected Signs of Intracranial Hypertension on Magnetic Resonance Imaging and Their Association With Papilledema. *JAMA Neurol.* 2021;78(6):718–725. doi:10.1001/jamaneurol.2021.0710

CSF Pressure

- CSF pressure in adults:
  - Normal: 60-200 mm H2O
  - Borderline: 200-250 mm H2O
  - Elevated: >250 mm H2O
- CSF pressure in children:
  - Normal: <250 mm H2O
  - Borderline: 250-280 mm H2O
  - Elevated: >280 mm H2O

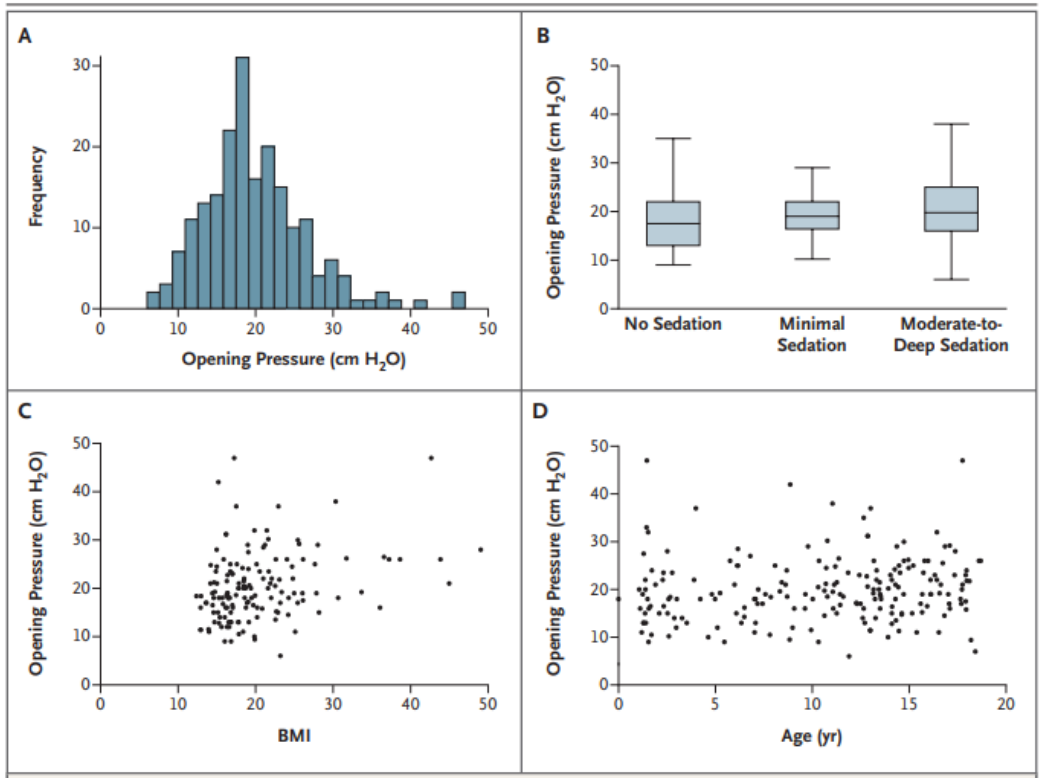
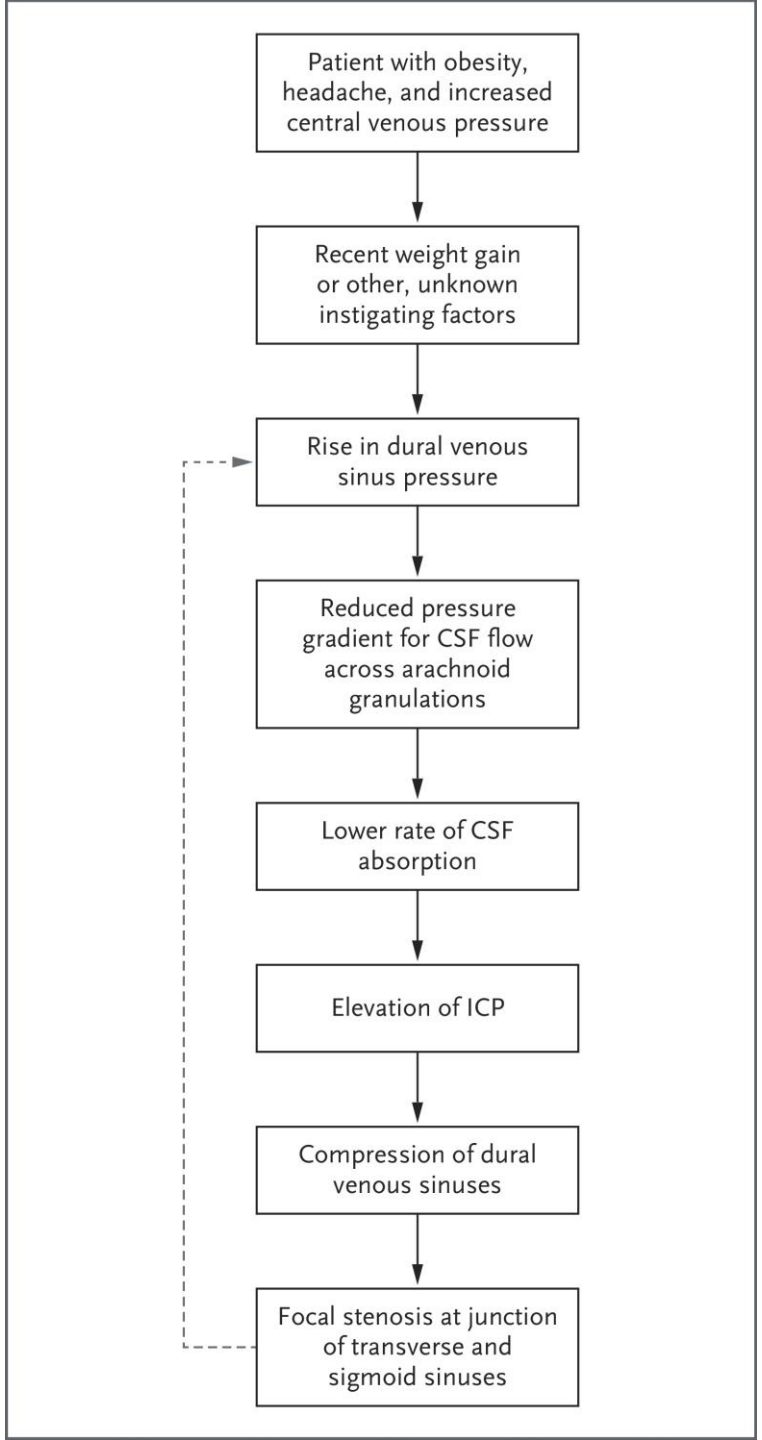


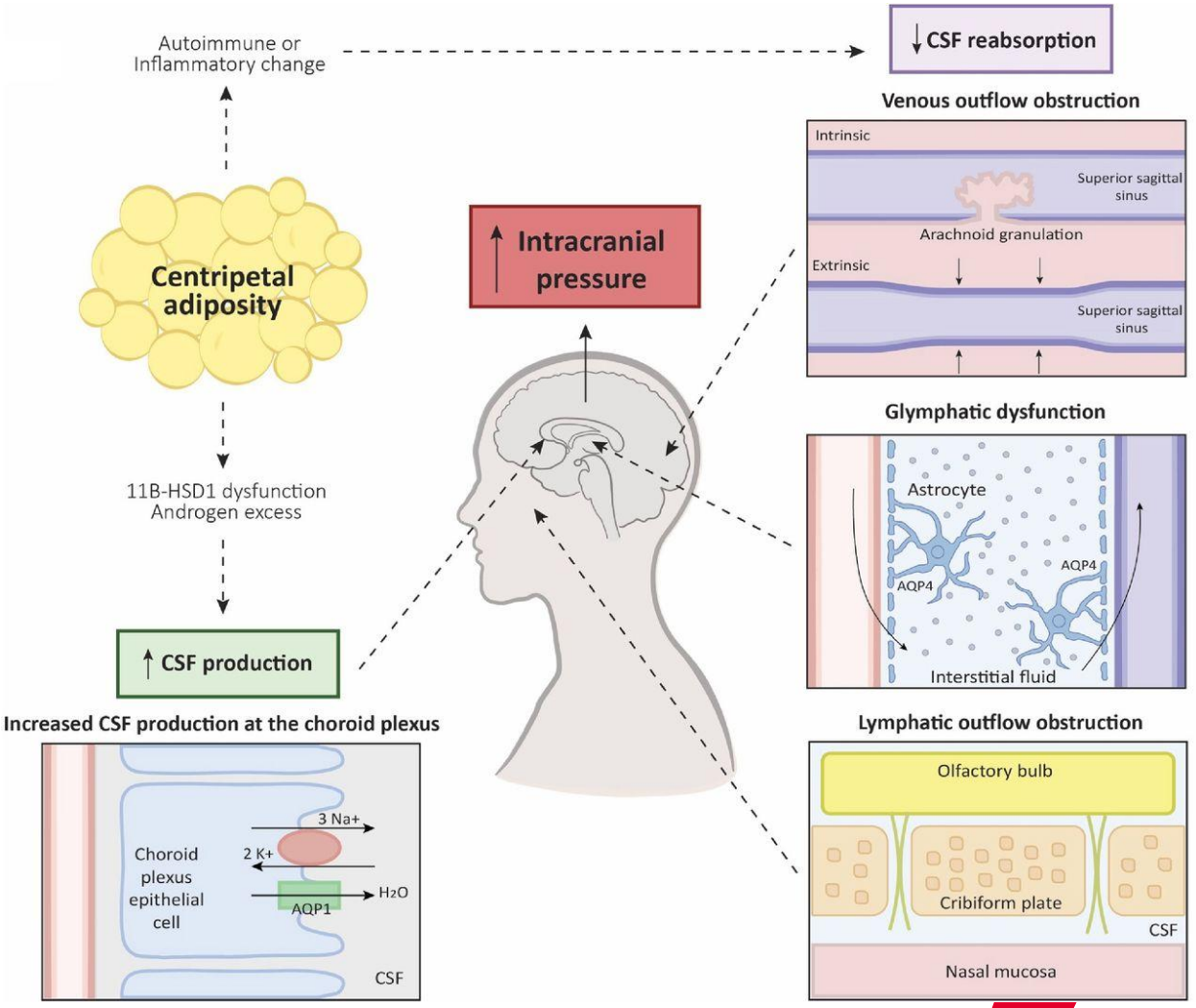
Figure 1. Distribution of CSF Opening Pressure and Effects of Sedation, Body-Mass Index, and Age.

Panel A shows the distribution of the cerebrospinal fluid (CSF) opening pressure for 197 study subjects who met the inclusion criteria for the reference group. The mean (±SD) CSF opening pressure was 19.8±6.8 cm of water. The values ranged from 6 to 47 cm of water and were similar in subjects 10 years of age or older and those younger than 10 years. The threshold for an abnormally elevated opening pressure, which was based on subjects with opening pressures in the 90th percentile or higher, was 28 cm of water. The threshold for an abnormally low opening pressure, based on subjects in the 10th percentile, was 11.5 cm of water. Panel B shows the results of an unadjusted linear regression analysis of the relationship between opening pressure and sedation (β=3.459, P=0.005). The relationship between opening pressure and body-mass index (BMI, the weight in kilograms divided by the square of the height in meters) is shown in Panel C (β=0.138, P=0.12) and that between opening pressure and age in Panel D (β=0.328, P<0.001). Statistically significant associations between opening pressure and moderate-to-deep sedation (β=4.990, P=0.002) and opening pressure and BMI (β=0.313, P=0.002) remained in multivariable analysis adjusted for age. In a multivariable linear regression model, no significant association was found between age (β=0.097, P=0.42) and opening pressure, even when age was categorized as 10 years or more or as less than 10 years (β=1.141, P=0.30). No significant association was found between opening pressure and sedation with ketamine (β=3.080; 95% confidence interval, −0.551 to 6.712; P=0.10).

Avery RA, Shah SS, Licht DJ, Seiden JA, Huh JW, Boswinkel J, Ruppe MD, Chew A, Mistry RD, Liu GT. Reference range for cerebrospinal fluid opening pressure in children. N Engl J Med. 2010 Aug 26;363(9):891-3. doi: 10.1056/NEJMc1004957. PMID: 20818852; PMCID: PMC3746184.



Postulated Mechanism of Idiopathic Intracranial Hypertension.



Horton JC. Idiopathic Intracranial Hypertension. N Engl J Med. 2025 Oct 9;393(14):1409-1419. doi: 10.1056/NEJMra2404929. PMID: 41061234.

Colman BD, Boonstra F, Nguyen MN, *et al*. Understanding the pathophysiology of idiopathic intracranial hypertension (IIH): a review of recent developments *Journal of Neurology, Neurosurgery & Psychiatry* 2024;**95**:375-383.

Treatments

- Acetazolamide
- Topiramate
- Furosemide
- Spironolactone

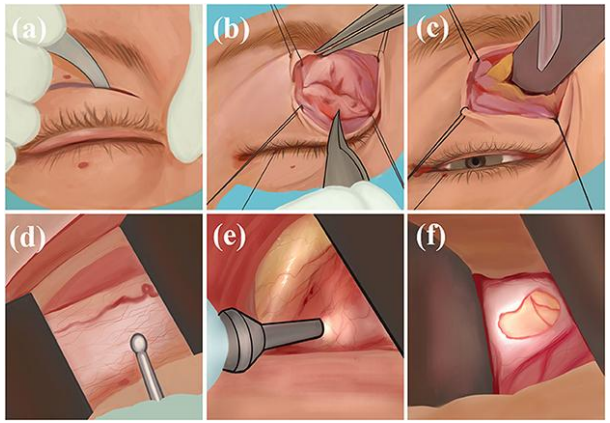
Medications

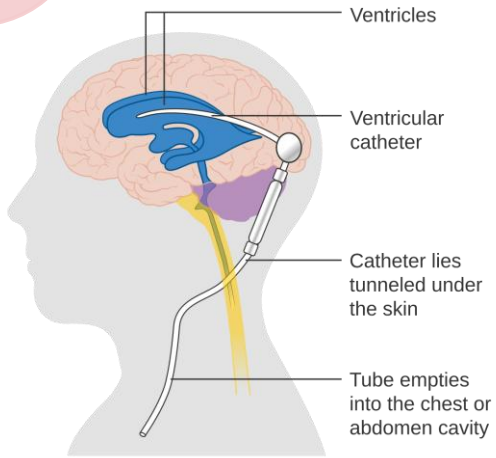
- Bariatric surgery
- GLP-1 and gastric inhibitory polypeptide agonists

Weight reduction

- Optic nerve sheath fenestration
- Venous sinus stenting, VPS

Surgical procedures





Weight loss studies in patients with idiopathic intracranial hypertension

- **6% weight loss**: Complete resolution of papilledema
- **15% weight loss**: Disease remission in some studies
- **24% weight loss**: Normalization of ICP and sustained disease remission

Authors	Number of Patients	Intervention	Outcomes
Newborg (58) (prospective)	9	Kempner's rice reduction diet for 10–135 weeks	Weight loss: 13%–38% (mean 25%). Papilledema resolved
Kupersmith et al (59) (retrospective)	58	Self-directed weight loss for 1.8–2.3 years (mean) ± acetazolamide	Comparison of patients losing ≥2.5 kg (mean 13.3 kg) and <2.5 kg (mean 0.2 kg): months to improve (mean): papilledema: 4.0 vs 6.7, visual fields: 4.6 vs 12.3, resolved papilledema: 74% vs 40%
Johnson et al (60) (retrospective)	15	Attempted weight loss ± acetazolamide for 4–24 weeks	Papilledema improved only in the 11 patients who lost weight and resolved in 10 patients. Mean weight loss with resolution was 6.2%
Sinclair et al (61) (prospective)	25*	425 cal per day diet ± acetazolamide for 3 months	Mean weight loss: 15.7 kg. Mean reduction of CSF opening pressure: 8 cm H_2O. Papilledema improved

JOURNAL OF NEURO-OPHTHALMOLOGY

Subramaniam, Suresh MD, MSc, FRCPC; Fletcher, William A. MD, FRCPC. Obesity and Weight Loss in Idiopathic Intracranial Hypertension: A Narrative Review. Journal of Neuro-Ophthalmology 37(2):p 197-205, June 2017. | DOI: 10.1097/WNO.0000000000000448

Surgical Options for Weight Reduction

- A randomized trial has shown that bariatric surgery was superior to weight-loss programs, leading to an average 21.4-kg weight loss and an average reduction in ICP at 12 months of 7.2 cm of water
- Gastric bypass was more effective than sleeve or banding operations, resulting in a mean weight loss of 36.0 kg and a mean decrease in ICP of 15.5 cm of water.

Mollan SP, Mitchell JL, Ottridge RS, et al. Effectiveness of bariatric surgery vs community weight management intervention for the treatment of idiopathic intracranial hypertension: a randomized clinical trial. *JAMA Neurol* 2021;78:678-686
Mollan SP, Mitchell JL, Yiangou A, et al. Association of amount of weight lost after bariatric surgery with intracranial pressure in women with idiopathic intracranial hypertension. *Neurology* 2022;99(11):e1090-e1099.

Effectiveness of Bariatric Surgery vs Community Weight Management Intervention for the Treatment of Idiopathic Intracranial Hypertension: A Randomized Clinical Trial

Table 2. Primary Outcome and Anthropometric Features by Treatment Arm

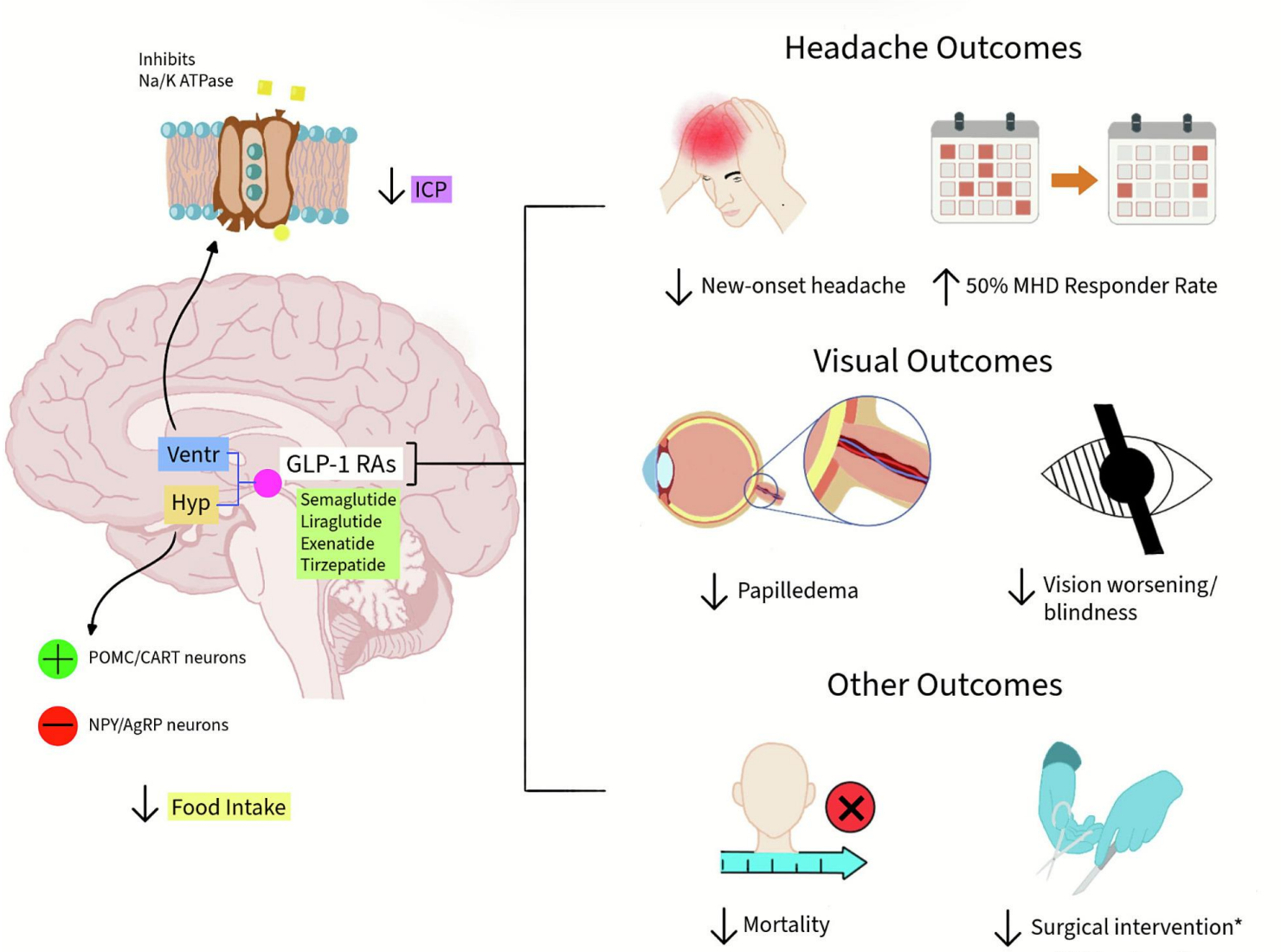
Outcome or feature	Baseline		At surgery		At 2 wk after surgery		At 12 mo		At 24 mo		Difference from baseline to 12 mo			Difference from baseline to 24 mo			Difference between arms at 12 mo			Difference between arms at 24 mo		
											Hierarchical regression			Hierarchical regression			Hierarchical regression			Hierarchical regression		
	Mean (SD)	Participants, No.	Mean (SD)	Participants, No.	Mean (SD)	Participants, No.	Mean (SD)	Participants, No.	Mean (SD)	Participants, No.	Mean (SE)	95% CI	*P* value	Mean (SE)	95% CI	*P* value	Mean (SE)	95% CI	*P* value	Mean (SE)	95% CI	*P* value
ICP (intention to treat), cm CSF																						
CWM intervention	34.6 (5.6)	33	NA	NA	NA	NA	32.0 (5.2)	25	31.0 (5.7)	18	−2.5 (1.4)	−5.2 to 0.3	.08	−3.5 (1.6)	−6.6 to −0.3	.03	−6.0 (1.8)	−9.5 to −2.4	.001	−8.2 (2.0)	−12.2 to −4.2	<.001
Bariatric surgery	34.8 (5.8)	33	NA	NA[a]	26.9 (8.1)	18	26.4 (8.7)	29	22.8 (7.8)	22	−8.7 (1.3)	−11.3 to −6.1	<.001	−11.9 (1.5)	−14.8 to −9.0	<.001						
ICP (per protocol), cm CSF																						
CWM intervention	34.6 (5.9)	33	NA	NA	NA	NA	32.4 (6.5)	26	31.4 (5.9)	17	−1.9 (1.4)	−4.6 to 0.7	.15	−3.0 (1.6)	−6.1 to 0.1	.06	−7.2 (1.8)	−10.6 to −3.7	<.001	−8.7 (2.0)	−12.7 to −4.8	<.001
Bariatric surgery	34.9 (5.4)	30	NA	NA[a]	NA	NA	25.7 (7.5)	28	22.8 (7.4)	23	−9.4 (1.3)	−12.1 to −6.8	<.001	−12.1 (1.4)	−14.9 to −9.3	<.001						
Weight, kg																						
CWM intervention	118.5 (20.7)	33	NA	NA	NA	NA	116.6 (22.3)	29	116.5 (22.9)	22	−2.1 (2.0)	−6.0 to 1.8	.29	−1.4 (2.2)	−5.6 to 2.9	.53	−21.4 (5.4)	−32.1 to −10.7	<.001	−26.6 (5.6)	−37.5 to −15.7	<.001
Bariatric surgery	118.4 (21.8)	33	113.3 (21.7)	27	102.3 (18.8)	18	94.0 (23.7)	30	88.9 (25.9)	24	−23.4 (1.9)	−27.2 to −19.6	<.001	−27.8 (2.1)	−31.9 to −23.8	<.001						
Excess body weight, kg																						
CWM intervention	50.6 (19.4)	33	NA	NA	NA	NA	49.1 (21.3)	29	49.5 (22.1)	22	−1.9 (1.9)	−5.7 to 1.9	.32	−1.3 (2.1)	−5.5 to 2.8	.53	−20.3 (5.1)	−30.3 to −10.2	<.001	−25.8 (5.3)	−36.1 to −15.5	<.001
Bariatric surgery	51.5 (20.0)	33	46.2 (20.0)	27	36.5 (16.4)	18	27.2 (22.3)	30	21.2 (24.9)	24	−23.0 (1.9)	−26.8 to −19.3	<.001	−28.0 (2.1)	−32.0 to −23.9	<.001						
BMI																						
CWM intervention	43.7 (7.1)	33	NA	NA	NA	NA	43.1 (7.8)	29	43.5 (8.0)	22	−0.7 (0.7)	−2.1 to 0.7	.35	−0.4 (0.8)	−1.9 to 1.2	.62	−7.3 (1.9)	−11.0 to −3.7	<.001	−9.4 (1.9)	−13.2 to −5.7	<.001
Bariatric surgery	44.2 (7.1)	33	42.2 (7.1)	27	38.9 (5.7)	18	35.1 (8.0)	30	32.8 (8.9)	24	−8.5 (0.7)	−9.9 to −7.2	<.001	−10.4 (0.8)	−11.8 to −8.9	<.001						

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); CSF, cerebrospinal fluid; CWM, community weight management; ICP, intracranial pressure; NA, not applicable.

[a] Intracranial pressure was not assessed until 2 weeks after surgery was performed.

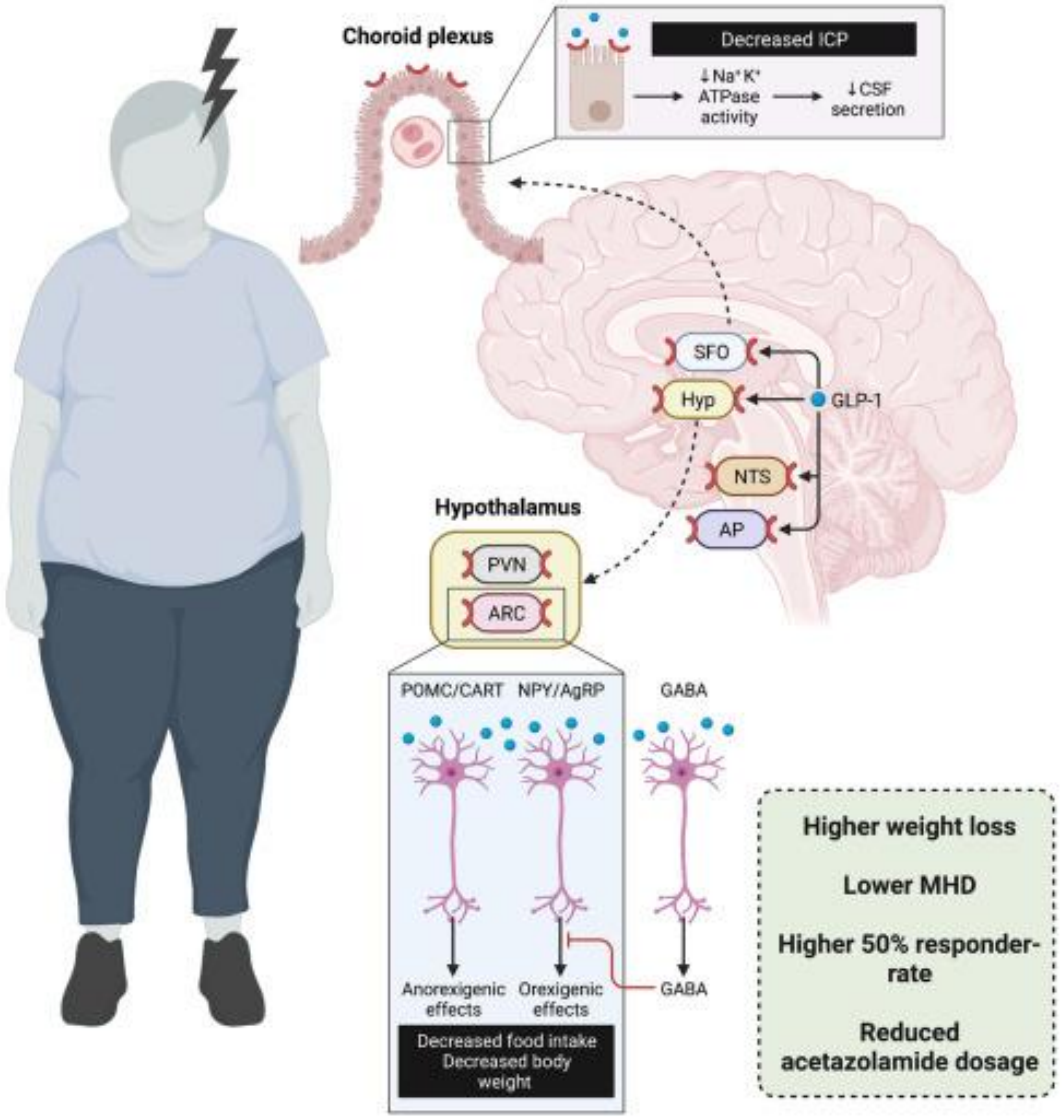
Mollan SP, Mitchell JL, Ottridge RS, et al. Effectiveness of Bariatric Surgery vs Community Weight Management Intervention for the Treatment of Idiopathic Intracranial Hypertension: A Randomized Clinical Trial. *JAMA Neurol.* 2021;78(6):678–686. doi:10.1001/jamaneurol.2021.0659

The role of GLP-1 RAs in patients with IIH



Efficacy of glucagon-like peptide-1 receptor agonists in idiopathic intracranial hypertension: A systematic review and meta-analysis. Ahmed, Warda et al. Journal of the Neurological Sciences, Volume 480, 125711

Treatment with GLP-1 receptor agonists is associated with significant weight loss and favorable headache outcomes in idiopathic intracranial hypertension



Methods

Study design: open-label, single-center, case-control pilot study
Cohort: 39 patients with IIH (pwIIH) and a BMI of ≥30 kg/m²
Intervention: GLP-1-RA (semaglutide, liraglutide) and/or usual care weight management (UCWM)
Primary endpoint: percentage weight loss at M6 compared to baseline
Secondary endpoints: rate of patients with a weight loss of ≥10%, MHD, rate of patients with a ≥30% and ≥50% reduction in MHD, visual outcome parameters, AEs

Main results

- Significantly higher mean weight loss in the GLP-1-RA group at M6 (−12.0% [3.3] vs. −2.8 [4.7]; $p<0.001$)
- More common weight loss of ≥10% in the GLP-1-RA group (69.2% vs. 4.0%; $p<0.001$).
- Significantly higher median reduction in MHD (−4 [−10.5, 0.5] vs. 0 [−3, 1]; $p=0.02$) and the 50% responder rate (76.9% vs. 40.0%; $p=0.04$) in the GLP-1-RA group
- Significantly higher median reduction in acetazolamide dosage in the GLP-1-RA group (−16.5% [−50, 0] vs. 0% [−25, 50]; $p=0.04$)
- Mild to moderate AEs, attributed to gastrointestinal symptoms in 9/13 patients

Higher weight loss

Lower MHD

Higher 50% responder-rate

Reduced acetazolamide dosage

Key message
This open-label, single-center pilot study suggests that GLP-1-RAs are an effective and safe treatment option for achieving significant weight loss with a favorable effect on headache, leading to reduced acetazolamide dosage in pwIIH.

AE: adverse event, AgRP: agouti-related peptide, AP: area postrema, BMI: body mass index, CART: cocaine- and amphetamine-regulated transcript, CSF: cerebrospinal fluid, GLP-1: glucagon-like peptide-1, GLP-1-RA: glucagon-like peptide-1 receptor agonist, Hyp: hypothalamus, ICP: intracranial pressure, IIH: idiopathic intracranial hypertension, MHC: monthly headache days, M6: six months, NPY: neuropeptide Y, NTS: nucleus tractus solitarii, POMC: proopiomelanocortin, pwIIH: patients with idiopathic intracranial hypertension, SFO: subfornical organ

Krajnc N, Itariu B, Macher S, Marik W, Harreiter J, Michl M, Novak K, Wöber C, Pemp B, Bsteh G. Treatment with GLP-1 receptor agonists is associated with significant weight loss and favorable headache outcomes in idiopathic intracranial hypertension. J Headache Pain. 2023 Jul 18;24(1):89. doi: 10.1186/s10194-023-01631-z. PMID: 37460968; PMCID: PMC10353241.

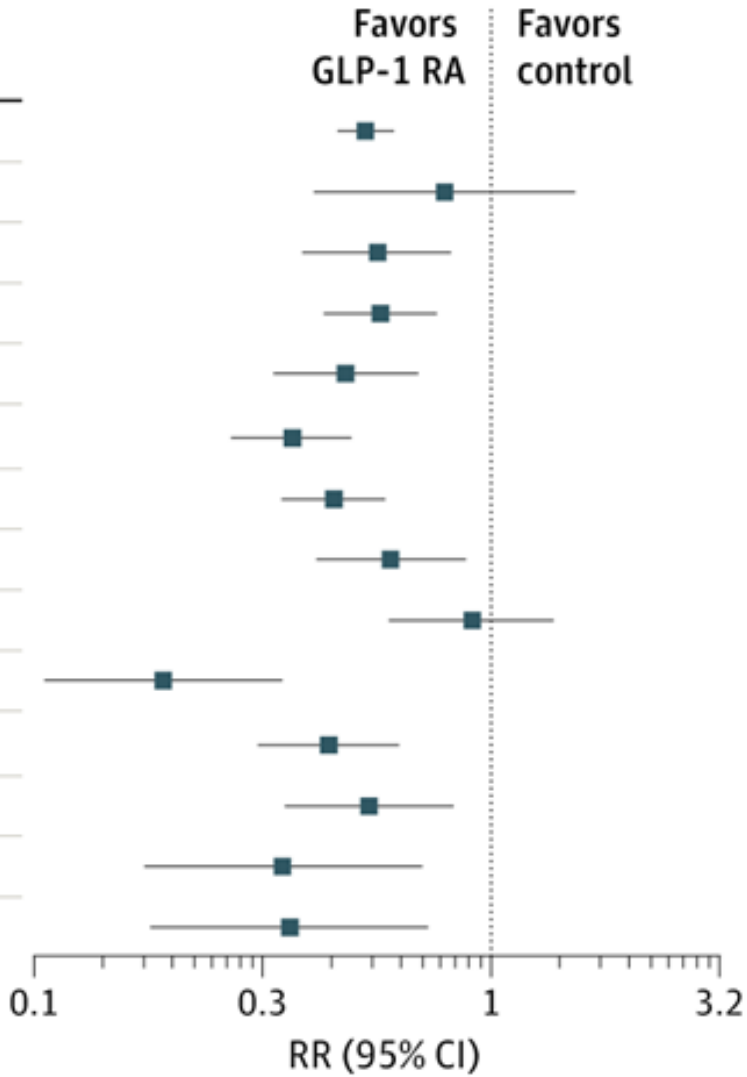
GLP-1 Receptor Agonists in Idiopathic Intracranial Hypertension

- Retrospective cohort study between 2005 and 2024, with a follow-up duration of 1 year. Accessed EHRs of 67 health care organizations. Participants were patients 18 years and older who had IIH
- Initiation of GLP-1 RA therapy within 6 months of IIH diagnosis. The control group included patients managed with conventional treatments, such as acetazolamide, topiramate, and dietary counseling, without GLP-1 RA exposure
- Outcomes included use of non–GLP-1 RA medication, symptoms and signs, procedures, and mortality over 1 year. (expressed as risk ratios (RRs) with 95% CI)
- 44 373 patients with IIH were identified. Before propensity score matching, the cohort included 603 GLP-1 RA users and 43 770 nonusers.
  - GLP-1 RA group was older (mean [SD] age, 43.2 [13.0] vs 35.5 [14.3] years; $P < .001$) with fewer male patients (n = 60 [10.0%] vs n = 5879 [13.5%]; $P = .01$) and a similar number of female patients (n = 522 [86.6%] vs n = 36 796 [84.3%]; $P = .13$)
  - After matching, 555 GLP-1 RAs users were compared with 555 nonusers
  - GLP-1 RA use was associated with lower medication use (RR, 0.53; 95% CI, 0.46-0.61; $P < .001$) and reduced headaches (RR, 0.45; 95% CI, 0.35-0.58; $P < .001$), visual disturbances or blindness (RR, 0.60; 95% CI, 0.41-0.88; $P = .007$), and papilledema (RR, 0.19; 95% CI, 0.10-0.34; $P < .001$)
  - Procedures (RR, 0.44; 95% CI, 0.30-0.63; $P < .001$) and mortality (RR, 0.36; 95% CI, 0.18-0.73; $P = .003$) were lower in the GLP-1 RA group
    - Mean (SD) body mass index (BMI) did not differ at follow-up (40.6 [9.2] vs 39.5 [8.7]; $P = .10$)
  - Sensitivity analysis stratified by BMI (≥40 vs <40) showed similar associations.
    - Bariatric surgery was associated with greater weight loss, but GLP-1 RA therapy was associated with better outcomes

Sioutas GS, Mualem W, Reavey-Cantwell J, Rivet DJ. GLP-1 Receptor Agonists in Idiopathic Intracranial Hypertension. *JAMA Neurol.* 2025;82(9):887–894. doi:10.1001/jamaneurol.2025.2020

Risk Ratios (RRs) With 95% CI for Outcomes at 1 Year

Outcome at 1 y	RR (95% CI)
Any medication	0.53 (0.46-0.61)
Valproate	0.79 (0.41-1.54)
Tricyclic antidepressants	0.56 (0.38-0.82)
Topiramate	0.57 (0.43-0.76)
Furosemide	0.48 (0.33-0.69)
Acetazolamide	0.36 (0.27-0.49)
Headache	0.45 (0.35-0.58)
Visual disturbances or blindness	0.60 (0.41-0.88)
Dizziness	0.91 (0.59-1.38)
Papilledema	0.19 (0.10-0.34)
Any procedure	0.44 (0.30-0.63)
Bariatric surgery	0.54 (0.35-0.82)
CSF shunt procedures	0.35 (0.17-0.70)
Mortality	0.36 (0.18-0.73)



Sioutas GS, Mualem W, Reavey-Cantwell J, Rivet DJ. GLP-1 Receptor Agonists in Idiopathic Intracranial Hypertension. *JAMA Neurol.* 2025;82(9):887–894. doi:10.1001/jamaneurol.2025.2020

Table 3. Comparison of Outcomes Between the GLP-1 RA and Control Groups Following After Score Matching

Outcomes	GLP-1 RA, No. (%) (n = 555)	Control, No. (%) (n = 555)	Risk ratio (95% CI)	*P* value
Medications				
Any medication	165 (29.7)	313 (56.4)	0.53 (0.46-0.61)	<.001[a]
Valproate	15 (2.7)	19 (3.4)	0.79 (0.41-1.54)	.49
TCA	38 (6.8)	68 (12.3)	0.56 (0.38-0.82)	.002[a]
Topiramate	62 (11.2)	109 (19.6)	0.57 (0.43-0.76)	<.001[a]
Furosemide	38 (6.8)	80 (14.4)	0.48 (0.33-0.69)	<.001[a]
Acetazolamide	48 (8.6)	133 (24.0)	0.36 (0.27-0.49)	<.001[a]
Symptoms and signs				
Headache	68 (12.3)	152 (27.4)	0.45 (0.35-0.58)	<.001[a]
Visual disturbances and blindness	39 (7.0)	65 (11.7)	0.60 (0.41-0.88)	.007[a]
Dizziness	38 (6.8)	42 (7.6)	0.91 (0.59-1.38)	.64
Papilledema	12 (2.2)	64 (11.5)	0.19 (0.10-0.34)	<.001[a]
Tinnitus	10 (1.8)[b]	12 (2.2)	NA	NA
Procedures				
Any procedure	38 (6.8)	87 (15.7)	0.44 (0.30-0.63)	<.001[a]
Bariatric surgery	30 (5.4)	56 (10.1)	0.54 (0.35-0.82)	.004[a]
CSF shunt procedures	10 (1.8)[b]	29 (5.2)	0.35 (0.17-0.70)	.002[a]
Optic nerve decompression	0	0	NA	NA
Mortality	10 (1.8)[b]	28 (5.0)	0.357 (0.175-0.728)	.003[a]
BMI, mean (SD)[c]	40.6 (9.2)	39.5 (8.7)	NA	.10

Sioutas GS, Mualem W, Reavey-Cantwell J, Rivet DJ. GLP-1 Receptor Agonists in Idiopathic Intracranial Hypertension. *JAMA Neurol.* 2025;82(9):887–894. doi:10.1001/jamaneurol.2025.2020

Abbreviations: BMI, body mass index; GLP-1 RA, glucagon-like peptide 1 receptor agonist; NA, not applicable; TCA, tricyclic antidepressant.

[a] Significant.

[b] TriNetX presents values of 1-10 as 10 for deidentification purposes. Methazolamide, optic atrophy, spinal puncture, and venous sinus stenting resulted in 1-10 in both groups. For CSF shunt procedures and mortality, risk ratios and *P* values were calculated using 10 as a value.

[c] Calculated as weight in kilograms divided by height in meters squared. Available for 325 patients (58.6%) in the GLP-1 RA group and 375 (67.6%) in the control group.

Recurrence of IIH in adults

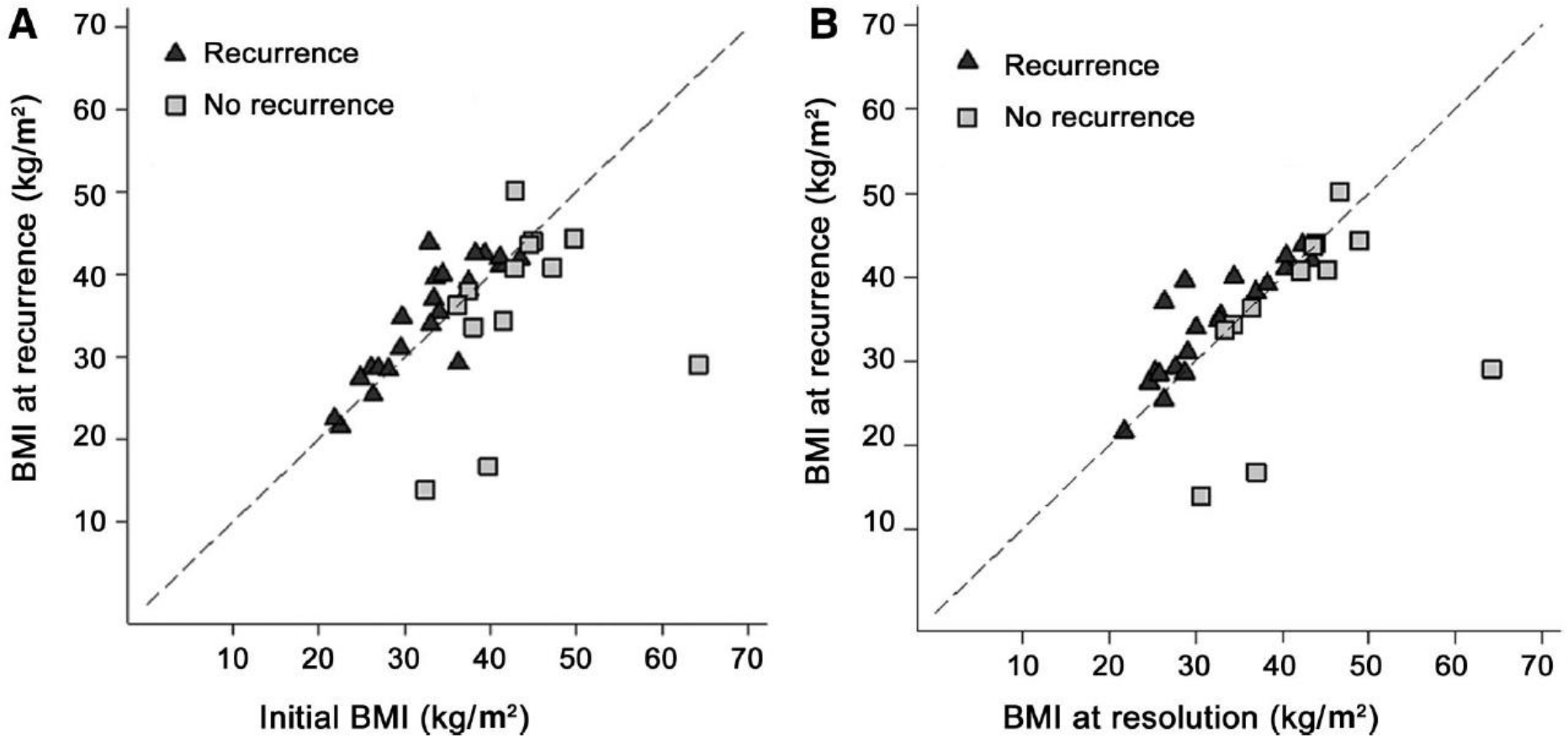
Table 2 Weight and body mass index characteristics

	IIH with recurrence (n = 26)	IIH without recurrence (n = 24)	*p* Value
BMI, diagnosis, kg/m^2, mean ± SD	32.7 ± 6.2	43.6 ± 8.7	
BMI, resolution, kg/m^2, mean ± SD	31.8 ± 6.5	42.4 ± 9.3	
BMI, recurrence kg/m^2, mean ± SD	34.5 ± 6.6	35.8 ± 10.6[a]	
BMI change between resolution and recurrence, kg/m^2, median	2.0 (−1.5 to 10.8)	−0.75 (−35.0 to 3.6)	0.0009
Rate of BMI gain/y, median	1.3 (−56 to 16.2)	−0.96 (−21.2 to 3.6)	
Percent weight change/y, median	3.8% (−9.9 to 61.5)	−0.3% (−9.9 to 7.8)	
Percent weight change			
Median	6% (−3.5 to 40.2)	0% (−9.6 to 10.1)	0.005
Mean	8.7% ± 11.7	−0.62% ± 5.41	

Abbreviations: BMI = body mass index; IIH = idiopathic intracranial hypertension.
[a] See Methods for description regarding how this value was calculated for patients without recurrence.

Ko MW, Chang SC, Ridha MA, Ney JJ, Ali TF, Friedman DI, Mejico LJ, Volpe NJ, Galetta SL, Balcer LJ, Liu GT. Weight gain and recurrence in idiopathic intracranial hypertension: a case-control study. Neurology. 2011 May 3;76(18):1564-7. doi: 10.1212/WNL.0b013e3182190f51. PMID: 21536635.

Figure Relation of body mass index (BMI) at recurrence to (A) initial BMI and (B) BMI at resolution in patients with and without recurrence



Rank correlations of recurrence vs initial BMI were $r_s = 0.83$, $p < 0.0001$ for recurrence, and $r_s = 0.52$, $p = 0.08$ for nonrecurrence groups. For recurrence vs resolution BMI, correlations were similar ($r_s = 0.89$, $p < 0.0001$ for recurrence, and $r_s = 0.59$, $p = 0.04$ for nonrecurrence groups).

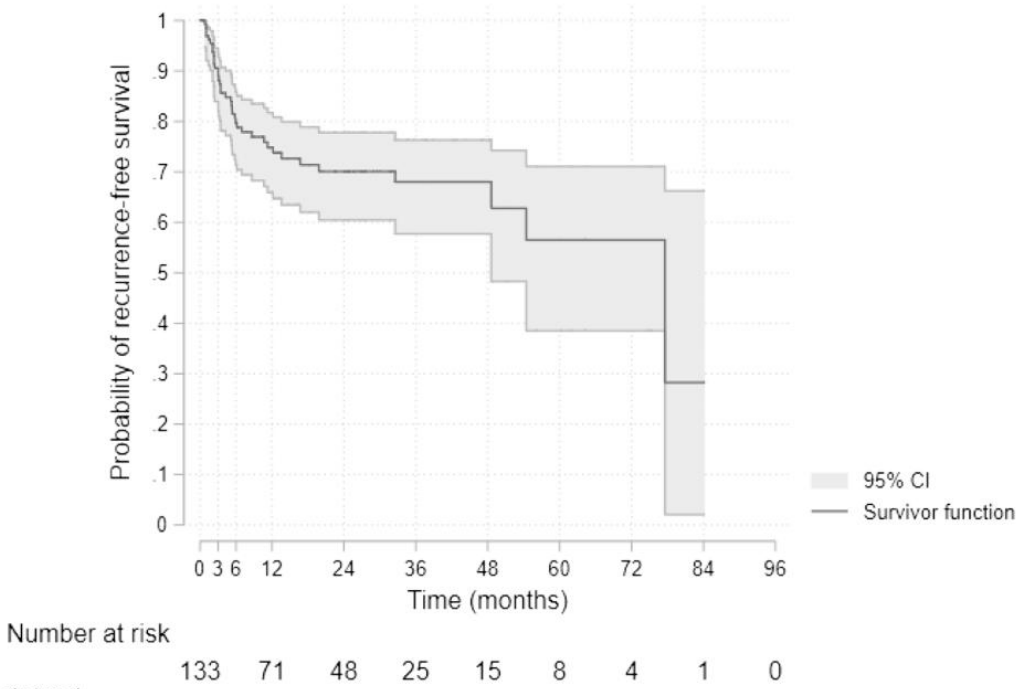
Ko MW, Chang SC, Ridha MA, Ney JJ, Ali TF, Friedman DI, Mejico LJ, Volpe NJ, Galetta SL, Balcer LJ, Liu GT. Weight gain and recurrence in idiopathic intracranial hypertension: a case-control study. Neurology. 2011 May 3;76(18):1564-7. doi: 10.1212/WNL.0b013e3182190f51. PMID: 21536635.

Recurrence of IIH in pediatrics

TABLE 3.

Relative Risk of Intracranial Hypertension Recurrence by Risk Factor

	RR (95% CI) *
Sex	
Male	0.95 (0.45, 2.03)
Female	Reference
Race	
Caucasian	2.82 (0.62, 12.81)
Non-Caucasian	Reference
IH etiology	
Primary	1.19 (0.56, 2.53)
Secondary	Reference
Age (years)	
<12 years	Reference
≥12 years	1.61 (0.79, 3.29)
BMI	
<30 (not obese)	Reference
≥30 (obese)	1.37 (0.66, 2.83)
Treatment duration before wean	
<3 months	Reference
≥3 and < 6 months	0.83 (0.16, 4.22)
≥6 and < 12 months	0.98 (0.21, 4.52)
≥12 and < 18 months	0.52 (0.08, 3.22)
≥18 months	0.80 (0.13, 4.80)
Reason for wean †	
Improved	Reference
Self-tapered	1.32 (0.47, 3.75)
Intolerant	3.91 (1.00, 15.36)
Presence of ONH edema †	4.56 (1.09, 19.12)
Presence of CN VI palsy	1.27 (0.56, 2.90)
Presence of headache †	0.40 (0.18, 0.85)
Presence of diplopia/crossed eyes	1.44 (0.59, 3.51)
Presence of pulsatile tinnitus	1.83 (0.58, 5.72)
Presence of TVOs	0.75 (0.14, 3.91)
Asymptomatic	1.45 (0.53, 4.01)



FIGURE

Kaplan-Meier recurrence-free survival estimate for first intracranial hypertension recurrence.

Alex AA, Jordan CO, Benedict JA, Aylward SC, Rogers DL, Inger HE. Intracranial Hypertension Recurrence Risk After Wean of Intracranial Pressure-Lowering Medication. Pediatr Neurol. 2021 Aug;121:40-44. doi: 10.1016/j.pediatrneurol.2021.05.002. Epub 2021 Jun 18. PMID: 34153813.

TABLE 1.

Demographic Data at Time of Initial Diagnosis

	Overall (n = 133)	No Recurrence (n = 95)	≥1 Recurrence (n = 38)
Sex, n (%)			
Male	49 (37)	36 (38)	13 (34)
Female	84 (63)	59 (62)	25 (66)
Race, n (%)			
Caucasian	113 (85)	77 (81)	36 (95)
Non-Caucasian	20 (15)	18 (19)	2 (5)
IH etiology, n (%)			
Primary	83 (62)	56 (59)	27 (71)
Secondary	50 (38)	39 (41)	11 (29)
Age (years), mean (S.D.)	11.1 (4)	11.0 (4)	11.5 (5)
BMI, n (%)			
<30 (not obese)	91 (68)	67 (71)	24 (63)
≥30 (obese)	42 (32)	28 (29)	14 (37)
Opening pressure (cm H_2O), mean (S.D.)	38 (11)	38 (11)	37 (9)
Treatment duration before wean, n (%)			
<3 months	16 (12)	14 (15)	2 (5)
≥3 and < 6 months	26 (20)	19 (20)	7 (18)
≥6 and < 9 months	37 (28)	25 (26)	12 (32)
≥9 and < 12 months	23 (17)	14 (15)	9 (24)
≥12 months	31 (23)	23 (24)	8 (21)
Reason for wean, n (%)			
Improved	101 (76)	72 (76)	29 (76)
Self-tapered	26 (20)	20 (21)	6 (16)
Intolerant	6 (4)	3 (3)	3 (8)
Presence of ONH edema, n (%)	112 (84)	76 (80)	36 (95)
Presence of CN VI palsy, n (%)	27 (20)	18 (19)	9 (24)
Presence of headache, n (%)	105 (79)	79 (83)	26 (68)
Presence of diplopia/crossed eyes, n (%)	24 (18)	17 (18)	7 (18)
Presence of pulsatile tinnitus, n (%)	16 (12)	12 (13)	4 (11)
Presence of TVOs, n (%)	10 (8)	8 (8)	2 (5)
Asymptomatic, n (%)	11 (8)	6 (6)	5 (13)

Recurrence of IIH in pediatrics

- The recurrence rate of idiopathic intracranial hypertension in pediatric patients ranges from **18% to 24%**
- Most recurrences occurring within the first **6 to 18 months** after initial remission or medication discontinuation.
- Weight gain of **5-15%** is a known risk factor for IIH recurrence in patients with prior disease.

Recurrence of IIH in Adults after discontinuation of GLP-1 RA

- Case study of a patient who stopped duraglutide abruptly due to lack of insurance coverage and regained all lost weight within one month, subsequently developing IIH
- Weight regain after GLP-1 RA discontinuation:
  - After stopping semaglutide, patients regain approximately two-thirds (68%) of their lost weight within one year, with mean weight regain of 11.6 percentage points
  - STEP-4 trial, participants who discontinued semaglutide after 20 weeks regained an average of 6.9% of their baseline body weight over the subsequent 48 weeks
  - Meta-analyses confirm that weight regain is proportional to the original weight loss: patients who took liraglutide regained 2.20 kg, while those on semaglutide/tirzepatide regained 9.69 kg
- No studies have systematically evaluated recurrence rates of IIH at 6 months or 1 year after stopping GLP-1 RAs in patients who achieved remission
- Substantial weight regain typical after GLP-1 RA discontinuation could precipitate IIH recurrence in susceptible individuals

Wilding JPH, Batterham RL, Davies M, Van Gaal LF, Kandler K, Konakli K, Lingvay I, McGowan BM, Oral TK, Rosenstock J, Wadden TA, Wharton S, Yokote K, Kushner RF; STEP 1 Study Group. Weight regain and cardiometabolic effects after withdrawal of semaglutide: The STEP 1 trial extension. Diabetes Obes Metab. 2022 Aug;24(8):1553-1564. doi: 10.1111/dom.14725. Epub 2022 May 19. PMID: 35441470; PMCID: PMC9542252.
Berg S, Stickle H, Rose SJ, Nemec EC. Discontinuing glucagon-like peptide-1 receptor agonists and body habitus: A systematic review and meta-analysis. Obes Rev. 2025 Aug;26(8):e13929. doi: 10.1111/obr.13929. Epub 2025 Apr 4. PMID: 40186344.
Heckel B. Idiopathic Intracranial Hypertension After Abrupt Cessation of Medication: A Case Report of Abrupt Glucagon-Like Peptide-1 (GLP-1) Receptor Agonist Cessation and Review of the Literature. Curr Pain Headache Rep. 2024 Jun;28(6):453-456. doi: 10.1007/s11916-024-01215-9. Epub 2024 Apr 4. PMID: 38573570; PMCID: PMC11156736.

Recurrence of IIH in pediatrics after discontinuation of GLP-1 RA

- There is no pediatric-specific data on the risk of IIH recurrence after discontinuing GLP-1 receptor agonists.
- The primary documented risk relates to rapid weight regain following GLP-1 RA discontinuation.
  - GLP-1 RAs produce modest weight reductions during treatment (mean difference -2.89 kg), but the durability of these effects after discontinuation has not been well-studied in children.
- **Discontinuation should be approached cautiously with close monitoring for at least 6-18 months, particularly during the first few months when weight regain is most rapid and IIH recurrence risk is highest. Weight management strategies should be intensified during and after medication wean.**

Alex AA, Jordan CO, Benedict JA, Aylward SC, Rogers DL, Inger HE. Intracranial Hypertension Recurrence Risk After Wean of Intracranial Pressure-Lowering Medication. Pediatr Neurol. 2021 Aug;121:40-44. doi: 10.1016/j.pediatrneurol.2021.05.002. Epub 2021 Jun 18. PMID: 34153813.
Heckel B. Idiopathic Intracranial Hypertension After Abrupt Cessation of Medication: A Case Report of Abrupt Glucagon-Like Peptide-1 (GLP-1) Receptor Agonist Cessation and Review of the Literature. *Curr Pain Headache Rep*. 2024;28(6):453-456. doi:10.1007/s11916-024-01215-9
Zhou L, Wei A, Pan C, Zhang J, Hu P, Lv X, Zhao X, Hu Y, He B, Liu Y, Dan R, Xu W, Liang X, Pan X, Zhu T, Li H, Wang Y. Effects of Glucagon-Like Peptide-1 Receptor Agonists After Treatment Withdrawal: A Systematic Review and Meta-Analysis. J Gen Intern Med. 2025 Nov 17. doi: 10.1007/s11606-025-09950-4. Epub ahead of print. PMID: 41249646.
Heckel B. Idiopathic Intracranial Hypertension After Abrupt Cessation of Medication: A Case Report of Abrupt Glucagon-Like Peptide-1 (GLP-1) Receptor Agonist Cessation and Review of the Literature. Curr Pain Headache Rep. 2024 Jun;28(6):453-456. doi: 10.1007/s11916-024-01215-9. Epub 2024 Apr 4. PMID: 38573570; PMCID: PMC11156736.
Ravid S, Shahar E, Schif A, Yehudian S. Visual Outcome and Recurrence Rate in Children With Idiopathic Intracranial Hypertension. J Child Neurol. 2015 Oct;30(11):1448-52. doi: 10.1177/0883073815569306. Epub 2015 Feb 23. PMID: 25713004.

Comprehensive Headache Team

- Headache Neurologists
  - Dr. Marc DiSabella
  - Dr. Raquel Langdon
  - Dr. Jeffrey Strelzik
  - Dr. William McClintock
  - Dr. Alexandra Kornbluh
  - Dr. Elizabeth Pickup
  - Dr. Mrinmayee Takle
- Headache Pain Psychology
  - Dr. Rebecca Neshkes
- Headache Nurse
  - Priscilla Smith
- Headache Coordinators
  - Jessica Keats
  - Lyndsey Knox
- Headache Research Coordinators
  - Ozge Aktop
  - Chloe Hooker



Clinical Research

Outpatient infusion outcomes
Botox in headache outcomes
Nerve block outcomes
New daily persistent headache outcomes
Melatonin for post-concussive syndrome

Clinical Trials Enrolling

Erenumab for episodic and chronic migraine prevention – Closed for analysis!
Rimegepant for migraine rescue 6-17yo
Eptinezumab for migraine prevention 12-17yo

Children's National

How to Claim CE Credit

1. Submit the **attendance code VASYEH** by:
   - Texting to **301-273-7643**, or
   - Entering **online** at ce.childrensnational.org/code
2. Complete the Evaluation
3. Download CE Certificate

Credit may be claimed up to 60 days from the date of the live event.

MASLD in the Pediatric Population: From Recognition to Management

Dr. Sloane Zimmerman, MD

MASLD Clinic Director



Children's National

Continuing Education – Learner Notification

Two Decades of Progress: Advancing Pediatric Obesity Care
September 18th, 2026

Notice of Requirement for Successful Completion

Participants may earn CE credit for this activity by attending the entire education session and completing the required evaluation. Instructions for claiming CE credit, including the attendance code, will be provided at the conclusion of the activity.

Nurses: Children's National Hospital designates this live activity for a maximum of 5.0 ANCC contact hours for nurses. Nurses should claim only the credit commensurate with the extent of their participation in the activity.

Physicians: Children's National Hospital designates this live activity for a maximum of 5.0 AMA PRA Category 1 Credits™ for physicians. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Pharmacists: Children's National Hospital is accredited by the Accreditation Council for Pharmacy Education (ACPE) as a provider of continuing pharmacy education. This program meets ACPE criteria for 5.0 contact hours.

Psychologists: Continuing Education (CE) credits for psychologists are provided through the co-sponsorship of the American Psychological Association (APA) Office of Continuing Education in Psychology (CEP). The APA CEP Office maintains responsibility for the content of the programs. Children's National Hospital designates this live activity for a maximum of 5.0 CE credits (Instructional Level: Intermediate Learning).

IPCE: This activity was planned by and for the healthcare team, and learners will receive 5.0 Interprofessional Continuing Education (IPCE) credit for learning and change.

Relevant Financial Relationships

The planning committee and presenters have no relevant financial relationships with ineligible companies.

Financial and In-Kind Commercial Support

No financial nor in-kind commercial support was received for this education activity.

JOINTLY ACCREDITED PROVIDER™ INTERPROFESSIONAL CONTINUING EDUCATION

NATIONAL HOSPITAL

In support of improving patient care, Children's National Hospital is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team. Children's National Hospital Accreditation Provider# 4008362.

Objectives

- By the end of this session, participants will be able to:
  - Define MASLD using current nomenclature
  - Understand the appropriate screening and diagnostic evaluation
  - Review current evidence-based management strategies
  - Discuss emerging therapies and future directions

Updated Nomenclature

- NAFLD → MASLD
- NASH → MASH
- Avoids previous stigmatizing language

https://www.aasld.org/new-masld-nomenclature

Clinical Definition

- Elevated AST/ALT (INR, albumin, and bilirubin should typically be normal)
- Chronic hepatic steatosis
- Not secondary to genetic or metabolic disorders, infection, steatogenic medications, ethanol consumption, or malnutrition
- At least 1 of 5 cardiometabolic criteria

Pediatric Criteria

At least 1 out of 5:

- ☐ BMI ≥ 85th percentile for age/sex [BMI z score ≥ +1] **OR** WC > 95th percentile **OR** ethnicity adjusted equivalent
- ☐ Fasting serum glucose ≥ 5.6 mmol/L [≥ 100 mg/dL] **OR** serum glucose ≥ 11.1 mmol/L [≥ 200 mg/dL] **OR** 2-hour post-load glucose levels ≥ 7.8 mmol [140 mg/dL] **OR** HbA1c ≥ 5.7% [39 mmol/L] **OR** already diagnosed/treated type 2 diabetes **OR** treatment for type 2 diabetes
- ☐ Blood pressure age < 13y, BP ≥ 95th percentile **OR** ≥ 130/80 mmHg (whichever is lower); age ≥ 13y, 130/85 mmHg **OR** specific antihypertensive drug treatment
- ☐ Plasma triglycerides < 10y, ≥ 1.15 mmol/L [≥ 100 mg/dL]; age ≥ 10y, ≥ 1.70 mmol/L [≥ 150 mg/dL] **OR** lipid lowering treatment
- ☐ Plasma HDL-cholesterol ≤ 1.0 mmol/L [≤ 40 mg/dL] **OR** lipid lowering treatment

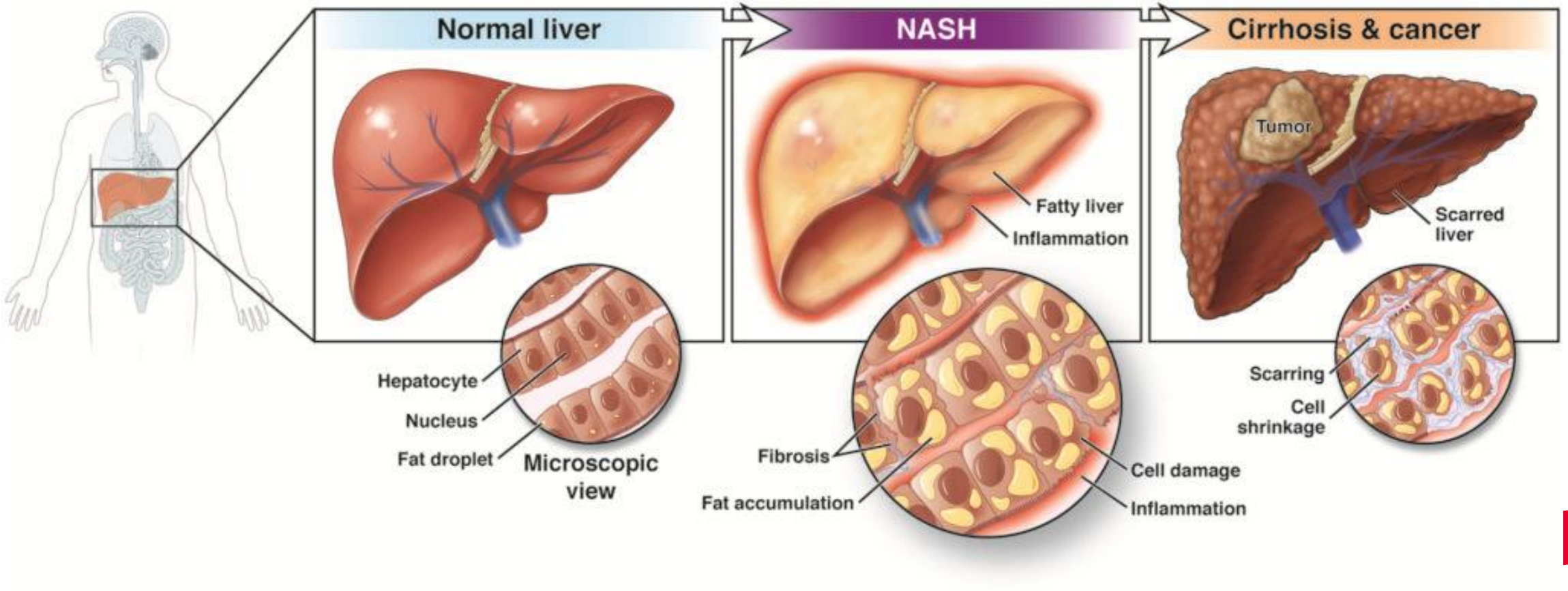
Rinella ME, et al. A multi-society Delphi consensus statement on new fatty liver disease nomenclature. *Hepatology*.

Why should we care about pediatric MASLD?

- Leading cause of liver disease in the US
  - 7.6% of the pediatric population
- Not just teenagers
- Disproportionately affects certain populations
- Advancement of disease/liver failure in adulthood

Butte NF, et al. Viva la Familia Study: genetic and environmental contributions to childhood obesity and its comorbidities in the Hispanic population. *Am J Clin Nutr*.

Progression of Disease



https://patient.gastro.org/masld-mash/

Screening

- Patients typically asymptomatic
- ALT is first-line – cost effective and universally available
- Upper limit of normal for ALT
  - Boys: 26 mg/dL
  - Girls: 22 mg/dL
- MASLD diagnostic cutoff is 2x ULN
  - Boys: >50 mg/dL
  - Girls: > 44 mg/dL

Imaging

- Ultrasound
  - Widely available, but poor performance
- MRI and MRS (magnetic resonance spectroscopy)
  - More accurate but expensive
- Transient elastography – a reliable compromise?
  - Estimates degree of fibrosis
  - Less invasive

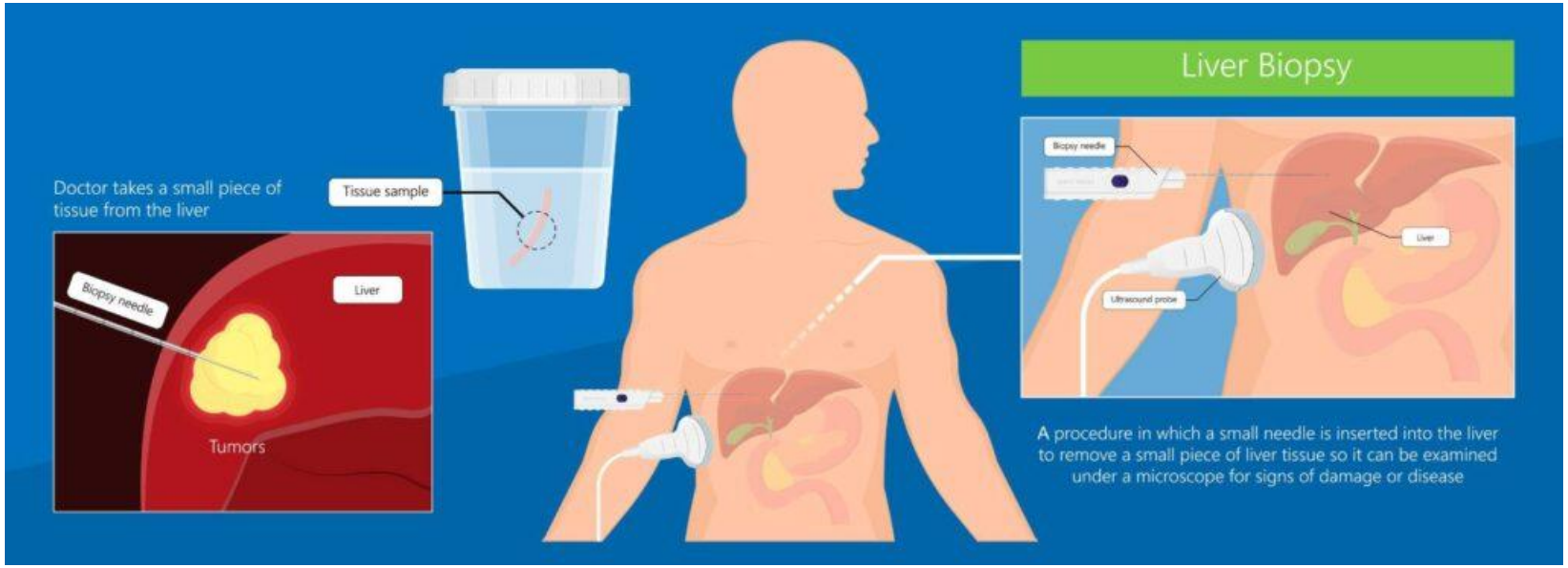
Jalil et al. Transient Elastography and Fibroscan: Stethoscope of a Hepatologist in Today's World. *Curr Hepatol Rep.*

Diagnosis of Exclusion

- Genetic/metabolic disorders
  - Wilson disease
  - Lysosomal acid lipase
- Medications
  - Amiodarone
  - Steroids
  - Methotrexate
  - Certain antipsychotics/antidepressants
  - HAART
  - Valproate
- Dietary
  - Alcohol
  - Protein-energy malnutrition
  - Rapid surgical weight loss
  - TPN
- Infection
  - Hep C

Liver Biopsy

- Gold standard diagnostic
- Confirms diagnosis and assesses for fibrosis
- Rules out other disease



Treatment

- Lifestyle interventions
- GLP-1s
- Bariatric surgery
- Mediterranean diet
- Reduce cardiac disease risk

Future Therapies

- Thyroid hormone receptor beta agonists
  - Effective for noncirrhotic MASLD (F2 to F3)
  - Resmetirom approved in March 2024
  - Awaiting pediatric clinical trials

GI Referral

- Indications for Referral
  - Persistent elevation of ALT >2× upper limit of normal (ULN) on at least 2 occasions, 3-6 months apart
  - ALT ≥ 80 at any time
  - Hepatic steatosis noted on imaging (ultrasound) with risk factors for MASLD
  - Presence of obesity (BMI ≥95th percentile) or overweight (BMI ≥85th percentile) with cardiometabolic risk factors
- Pre-referral Workup
  - Repeat ALT, AST, GGT, fractionated bilirubin, albumin, INR
  - Metabolic screening: HbA1c, fasting lipids
  - Baseline abdominal ultrasound within past 12 months

MASLD Clinic

- Review of PMHx
- Dietary and exercise counseling
- Assessment for other comorbidities
- Close follow up with GI and dietitian



Children's National®

How to Claim CE Credit

1. Submit the **attendance code VASYEH** by:
   - Texting to **301-273-7643**, or
   - Entering **online** at ce.childrensnational.org/code
2. Complete the Evaluation
3. Download CE Certificate

Credit may be claimed up to 60 days from the date of the live event.

Type 2 Diabetes in Youth

Elizabeth Estrada, MD
Endocrinology

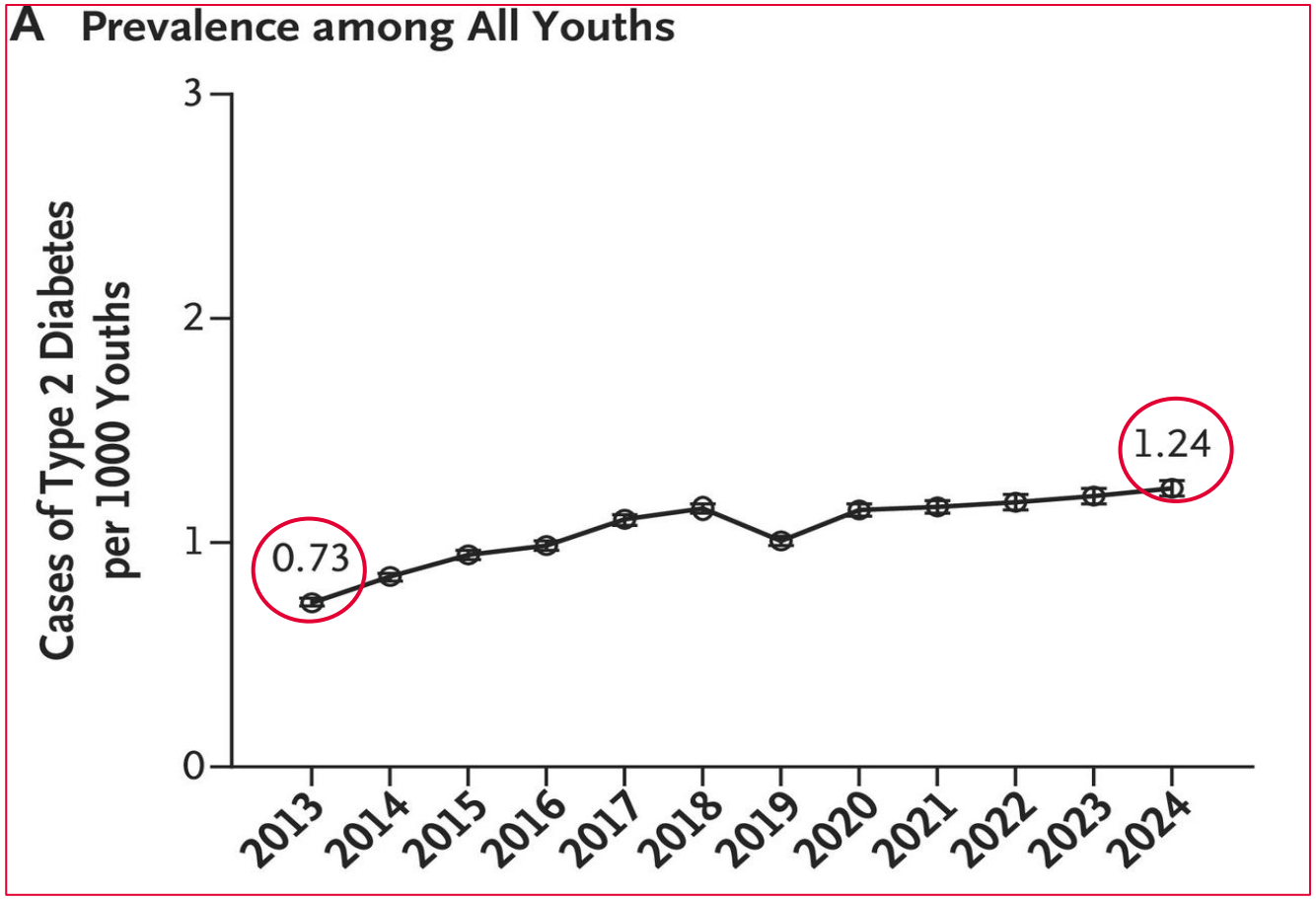
Children's National

Objectives

- Discuss the epidemiology of type 2 diabetes in childhood
- Review the pathophysiology
- Discuss the screening guidelines, evaluation, and treatment of type 2 diabetes in childhood

Epidemiology

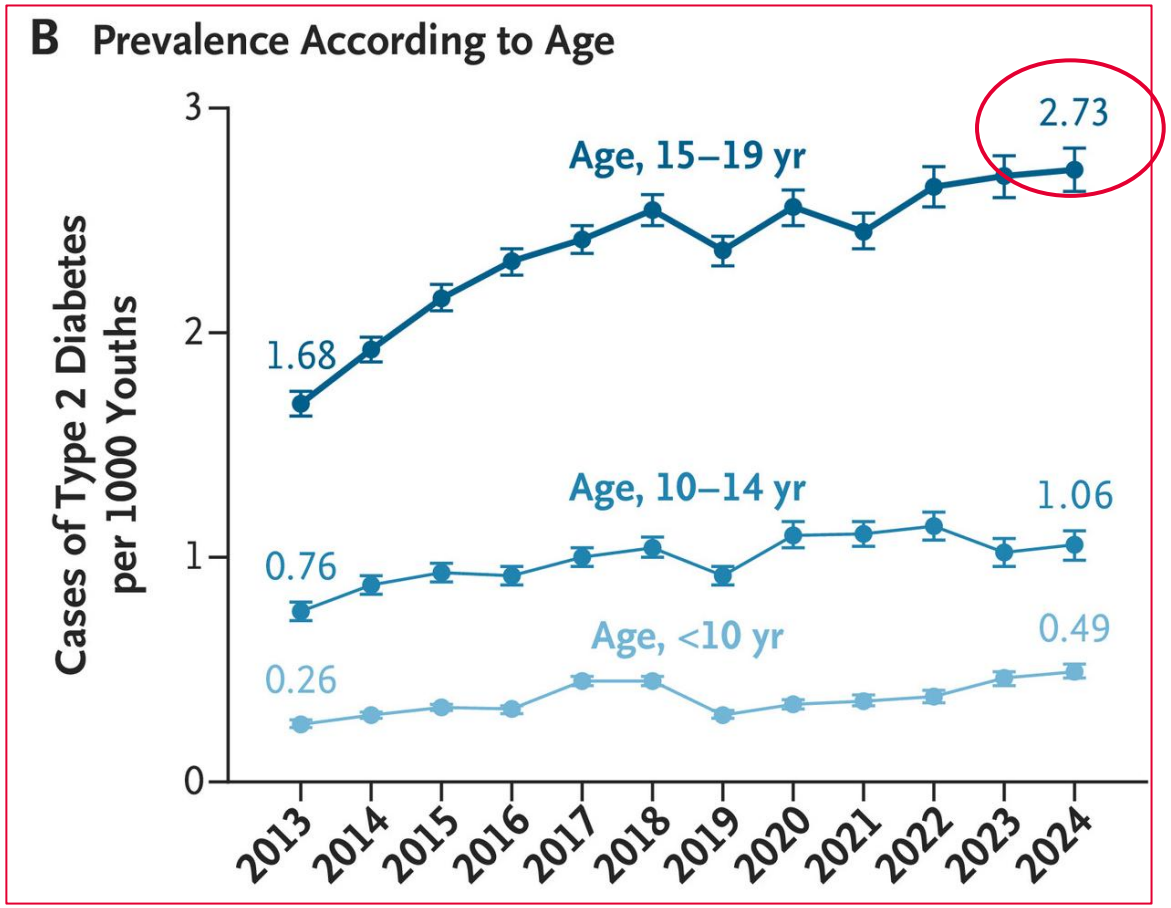
Increased Prevalence of Type 2 Diabetes among U.S. Youths 2013 - 2024



- Sample 18 million youths under 20 y
- EHR data from the OptumLabs Data Warehouse, 2013 to 2024.

Trends in Youth-Onset Type 2 Diabetes, 2013–2024. NEJM, April 2026

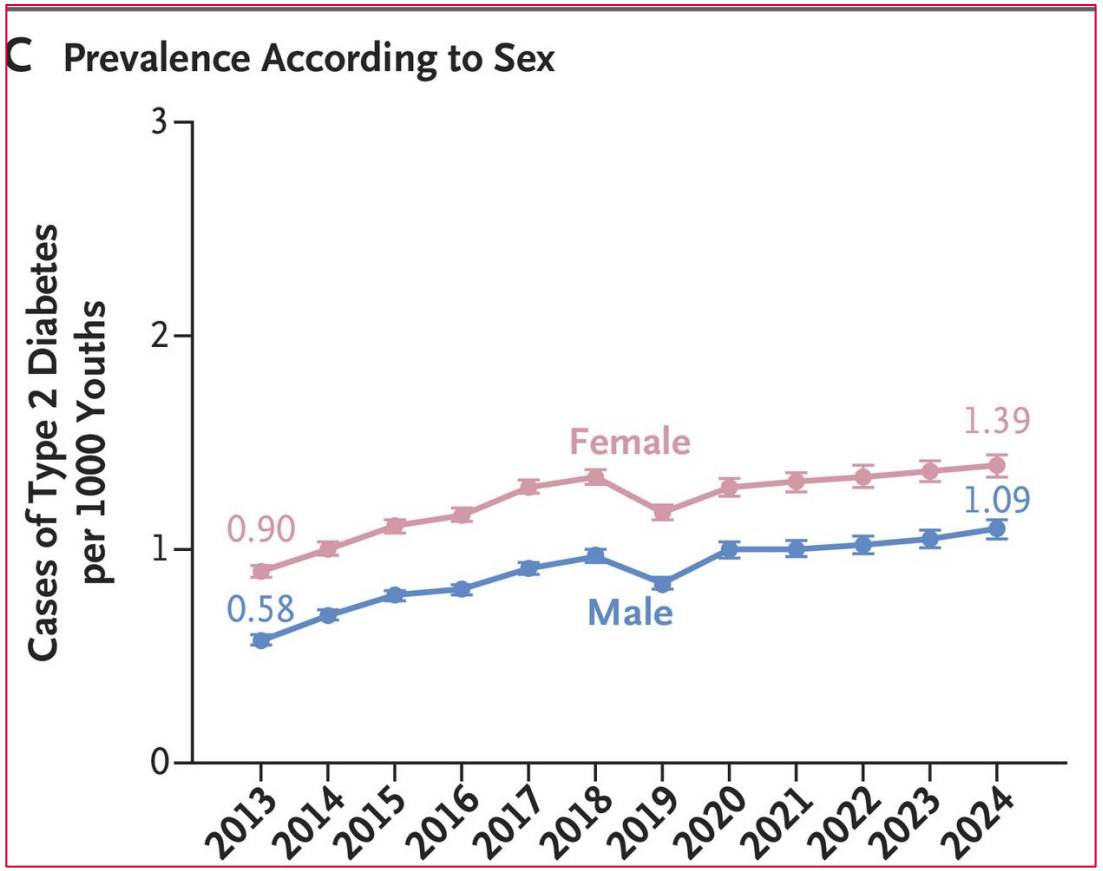
Increased Prevalence of Type 2 Diabetes among U.S. Youths Between 2013 and 2024



- Sample 18 million youths under 20 y
- EHR data from the OptumLabs Data Warehouse, 2013 to 2024.

Trends in Youth-Onset Type 2 Diabetes, 2013–2024. NEJM, April 2026

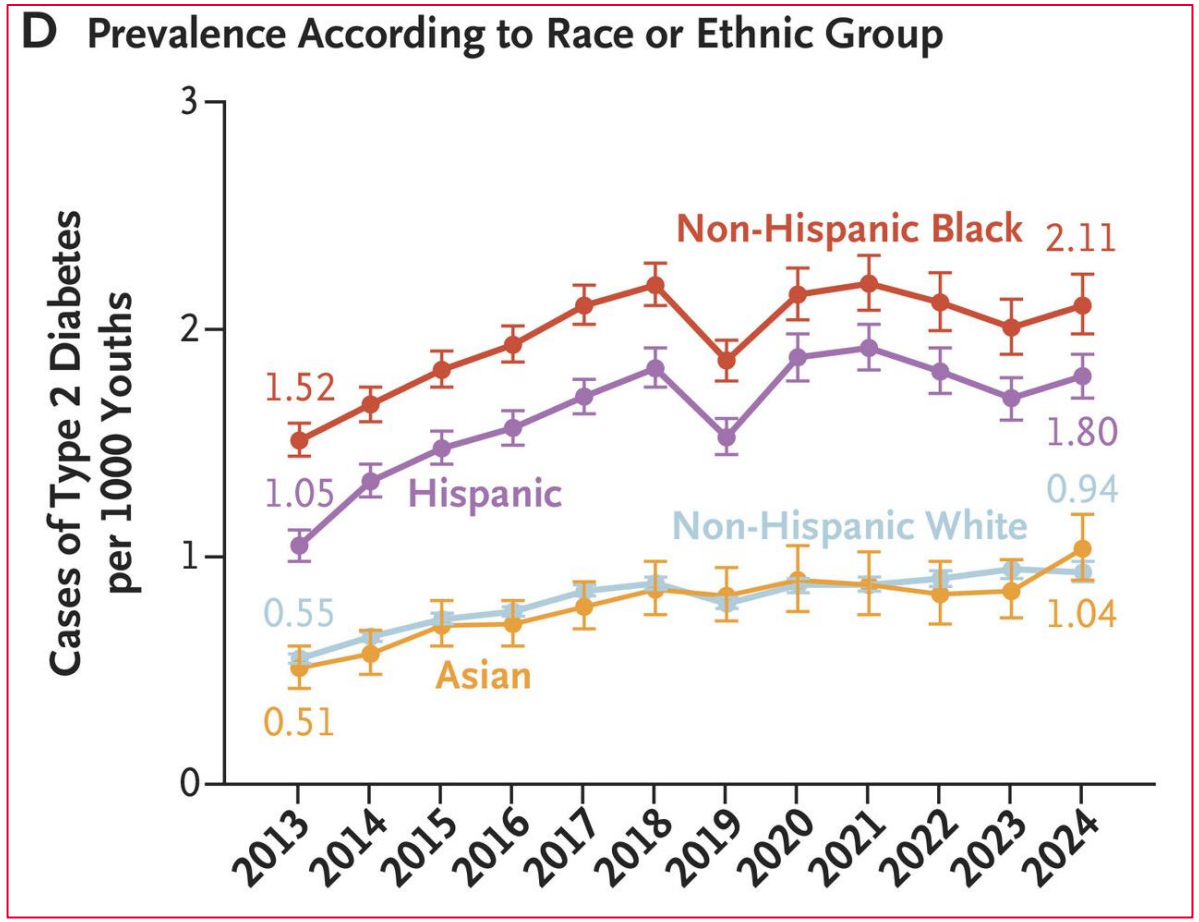
Increased Prevalence of Type 2 Diabetes among U.S. Youths Between 2013 and 2024



- Sample 18 million youths under 20 y
- EHR data from the OptumLabs Data Warehouse, 2013 to 2024.

Trends in Youth-Onset Type 2 Diabetes, 2013–2024. NEJM, April 2026

Increased Prevalence of Type 2 Diabetes among U.S. Youths Between 2013 and 2024

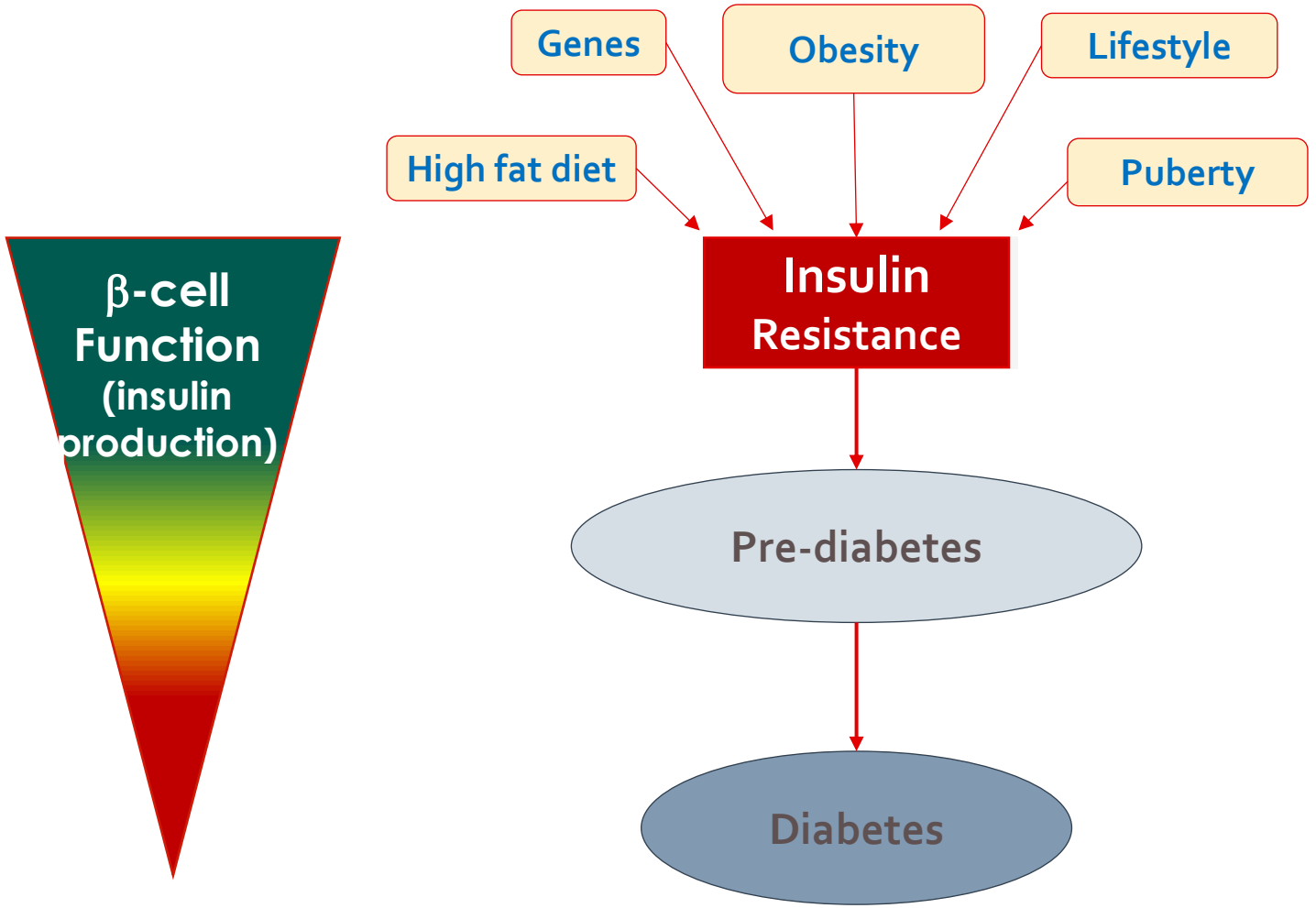


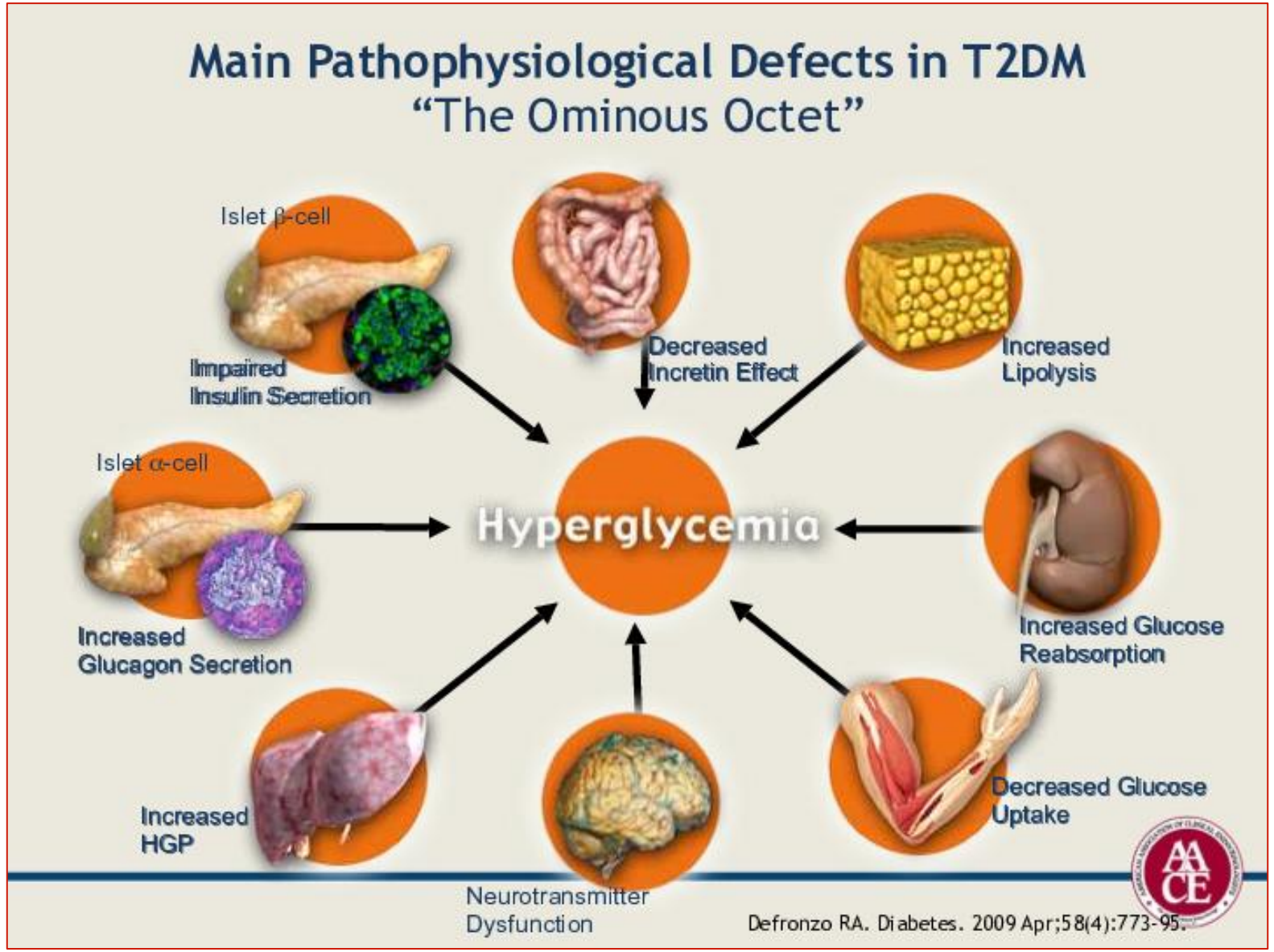
- Sample 18 million youths under 20 y
- EHR data from the OptumLabs Data Warehouse, 2013 to 2024.

Trends in Youth-Onset Type 2 Diabetes, 2013–2024. NEJM, April 2026

Pathophysiology

Type 2 diabetes; Pathophysiology




Main Pathophysiological Defects in T2DM
"The Ominous Octet"
Islet β-cell
Impaired
Insulin Secretion
Decreased
Incretin Effect
Increased
Lipolysis
Islet α-cell
Hyperglycemia
Increased
Glucagon Secretion
Increased Glucose
Reabsorption
Increased
HGP
Neurotransmitter
Dysfunction
Decreased Glucose
Uptake
Defronzo RA. Diabetes. 2009 Apr;58(4):773-95.

Rapid Disease Progression
Early Development of Complications

TODAY2 Treatment Options for type 2 Diabetes in Adolescents & Youth

- **Initial Clinical Trial (TODAY Phase 1):** Conducted from **2004 to 2011**

  Enrolled 699 subjects

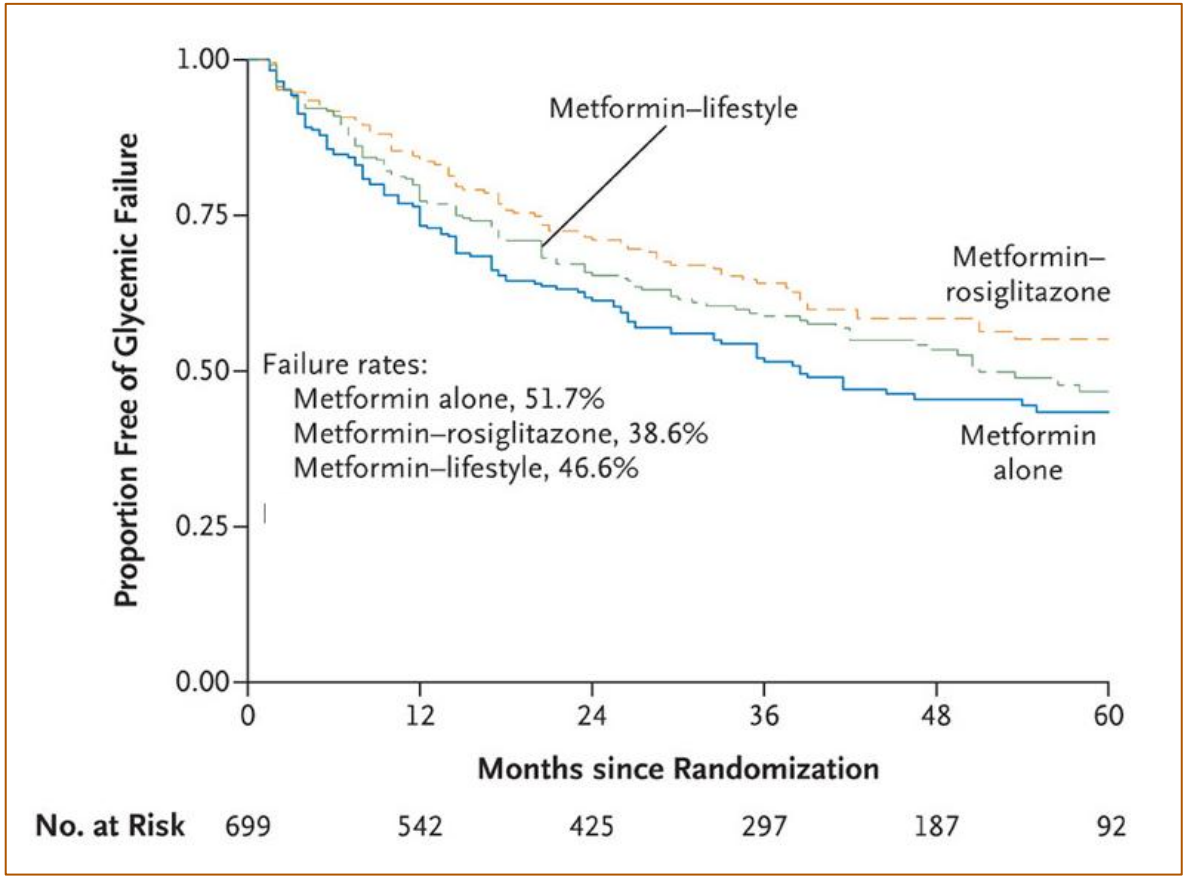
  - Metformin
  - Metformin + rosiglitazone
  - Metformin + intensive lifestyle

- **First Follow-Up Phase (TODAY2 Phase 1): 2011 to 2014**
  - added three years of continued treatment tracking

- **Observational Follow-Up (TODAY2 Phase 2): 2014 to 2020**
  - monitoring the long-term progression and complications

N Engl J Med 2012; 366:2247-2256

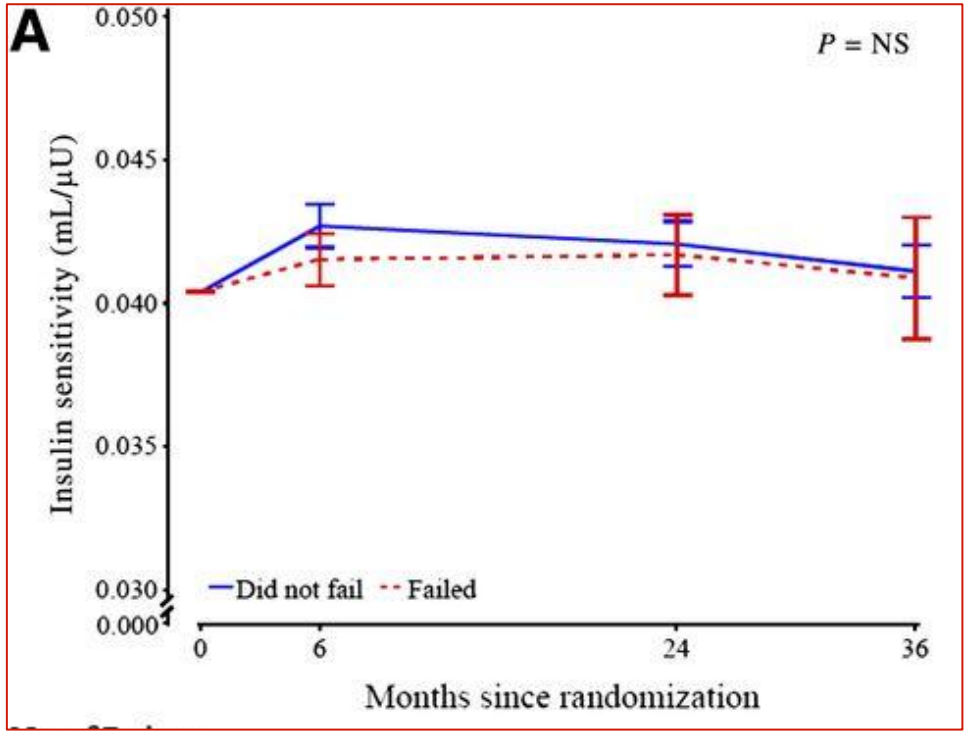
TODAY Study: Survival from Glycemic Failure

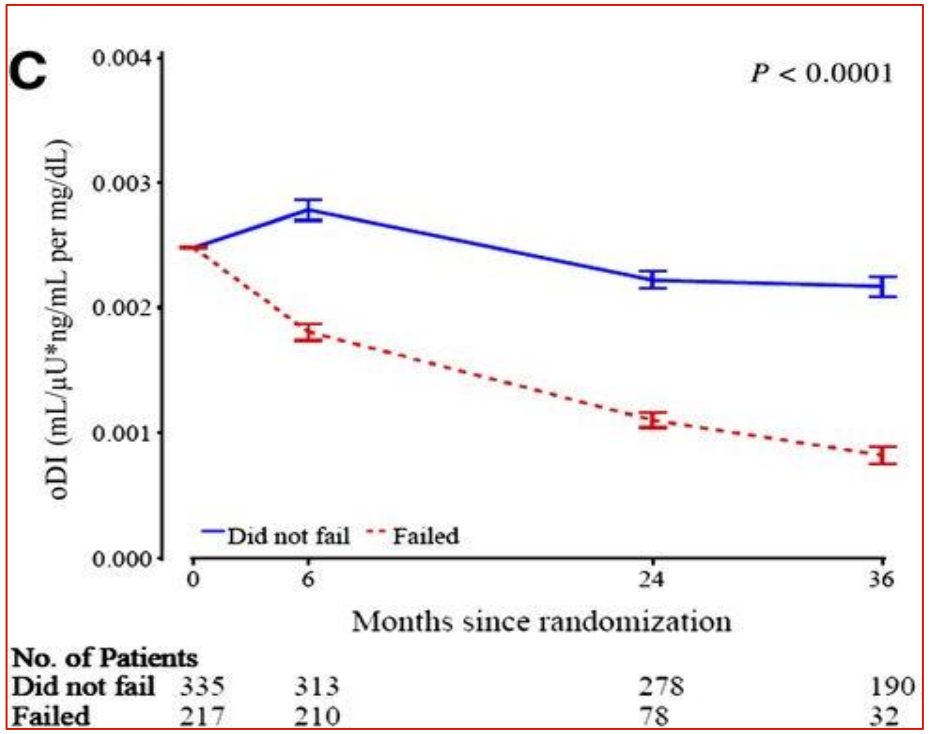


- 45.6% loss glycemic control with on a median time of 11 months

N Engl J Med 2012; 366:2247-2256

Loss of β-cell function is the primary predictor of failure of glycemic control



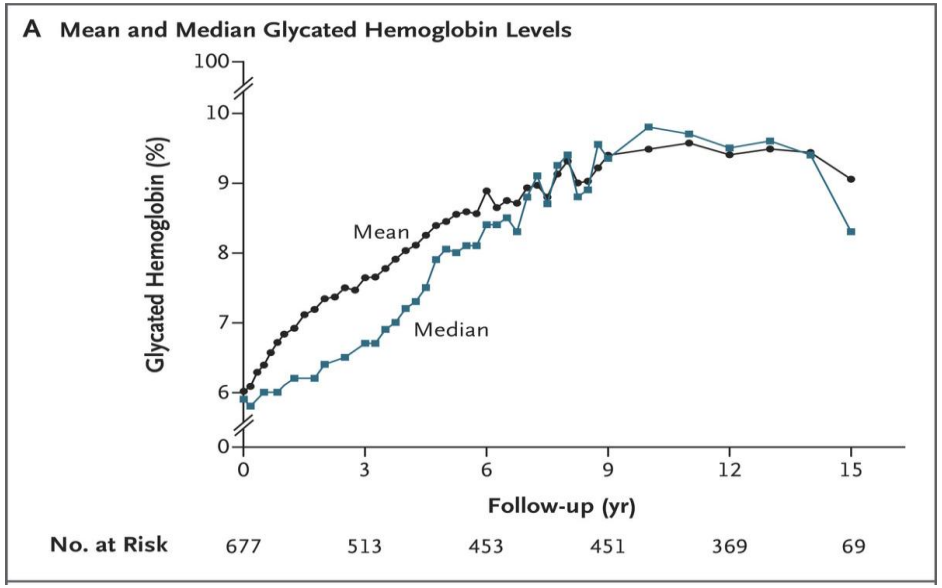


OGTT-Derived Measures
All 3 treatment groups

TODAY Study Group. Diab Care 2013

TODAY Study Group: Long-term Complications in Youth-Onset Type 2 Diabetes

Glycated Hemoglobin Over 15 Years

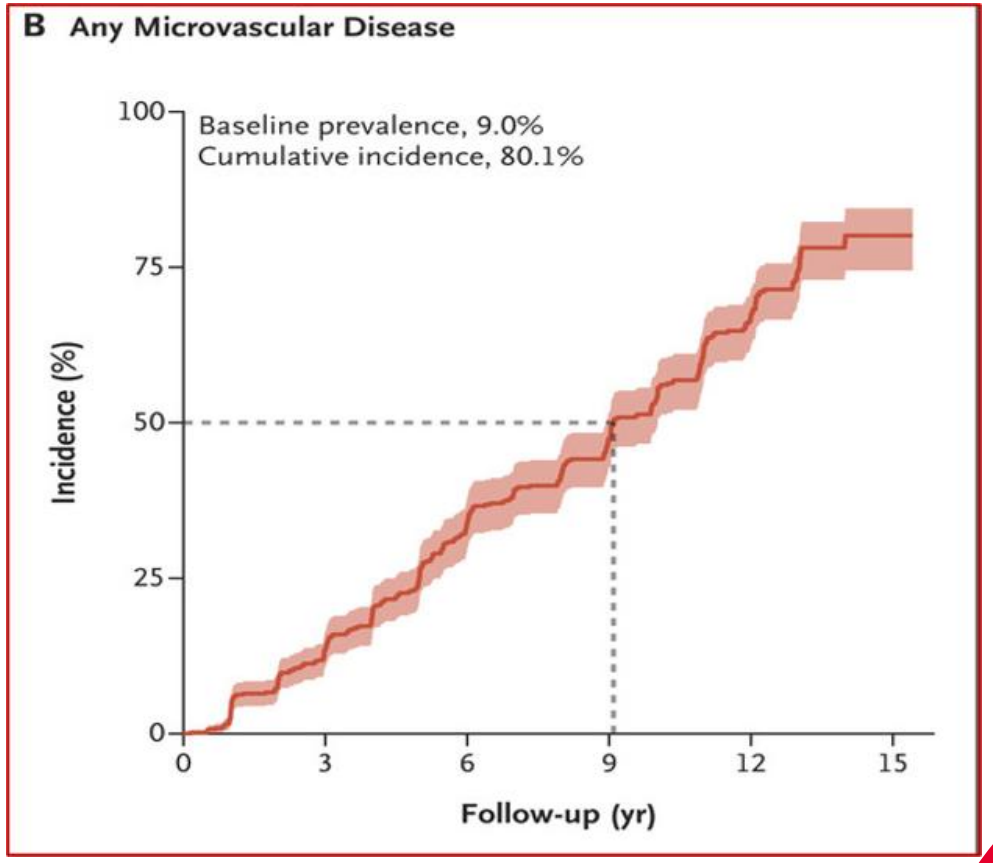


TODAY Study Group. N Engl J Med 2021

TODAY Study Group: Long-term Complications in Youth-Onset Type 2 Diabetes

- Complications affected most participants by the time of young adulthood
  - Retinopathy
  - Nephropathy
  - Neuropathy
  - Increased risk for CVD

- More common among minority race/ethnic groups



TODAY Study Group. N Engl J Med 2021

Screening

RISK-BASED - BMI ≥85%, >10 years or Tanner 2

Repeat screening every 3 years, or more frequently if BMI percentile is increasing

Overweight or obese:
BMI ≥85th percentile for age and gender
Plus 1 or more of the following additional risk factors:*
Maternal history of diabetes or gestational diabetes mellitus during the child's gestation
Family history of type 2 diabetes mellitus in a first- or second-degree relative
High-risk race/ethnicity (Native American, African American, Latino, Asian American, Pacific Islander)
Signs of insulin resistance on physical examination or conditions associated with insulin resistance (acanthosis nigricans, hypertension, dyslipidemia, polycystic ovary syndrome, or small for gestational age birth weight)

Screening Labs: Interpretation

Test	Pre-Diabetes	Diabetes
Fasting Glucose	100-126 mg/dl	≥126 mg/dl
2-hr OGTT	140-200 mg/dl	≥200 mg/dl
Random Glucose		>200 mg/dl plus symptoms
HbA1C	5.7-6.4%	≥6.5%

Presentation

- Asymptomatic
- Vaginitis, UTI
- Obesity – Consider weight loss prior to diagnosis
- Acanthosis nigricans
- Polyuria, polydipsia, weight loss
- DKA or HHS (more frequent AA)



Management

Weight Management

- Goal to lose 7-10% excess weight

- Complex social and environmental context surrounding youth with type 2 diabetes

- Individual-level lifestyle interventions may not be sufficient to target the complex interplay of family dynamics, mental health, community readiness, and the broader environmental system

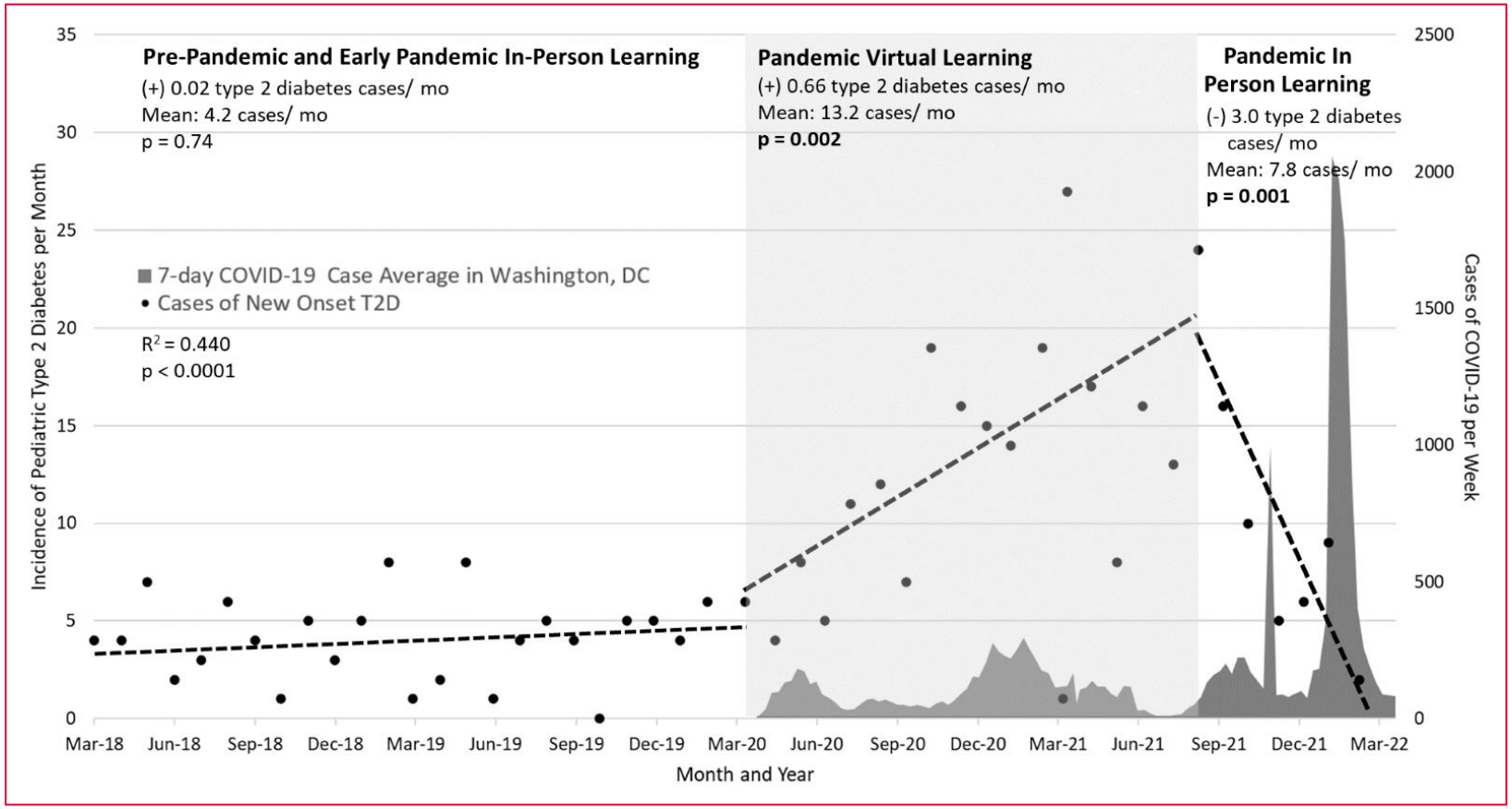
Increase in Type 2 Diabetes New Cases During COVID-19 Virtual Learning - Children's National Data

- Pre-pandemic in-person learning: 4.2 cases/month
- 217% during virtual learning: 13.2 cases/month
- Declined with return to in-person learning: 7.8 cases/month

Disproportionate impact on underserved communities

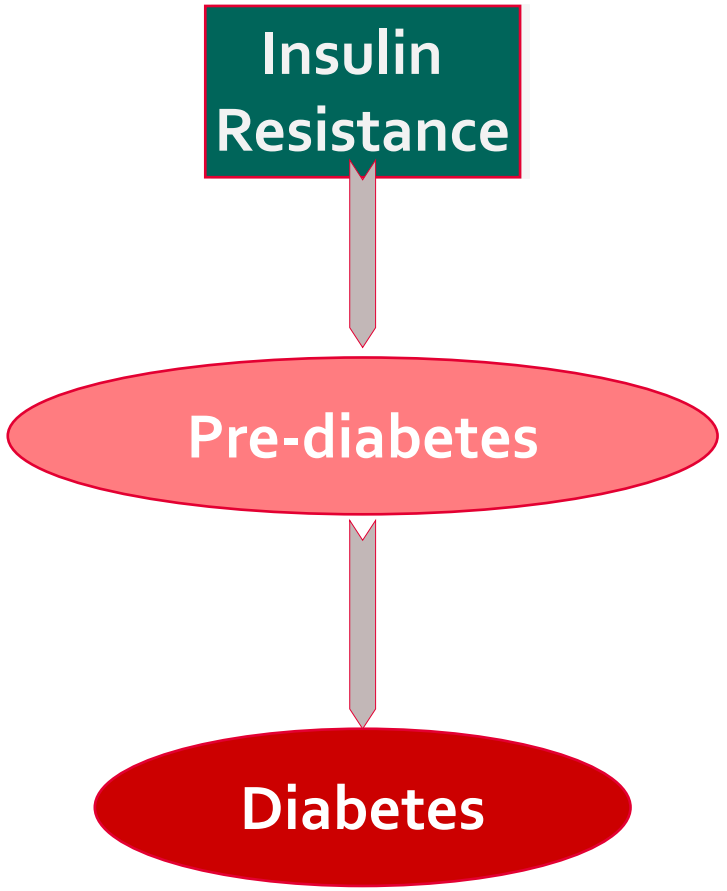
NHB 4.2 times

Hispanics 2.1 times



Grundman et al. Clin. Med. 2025, 14, 7995

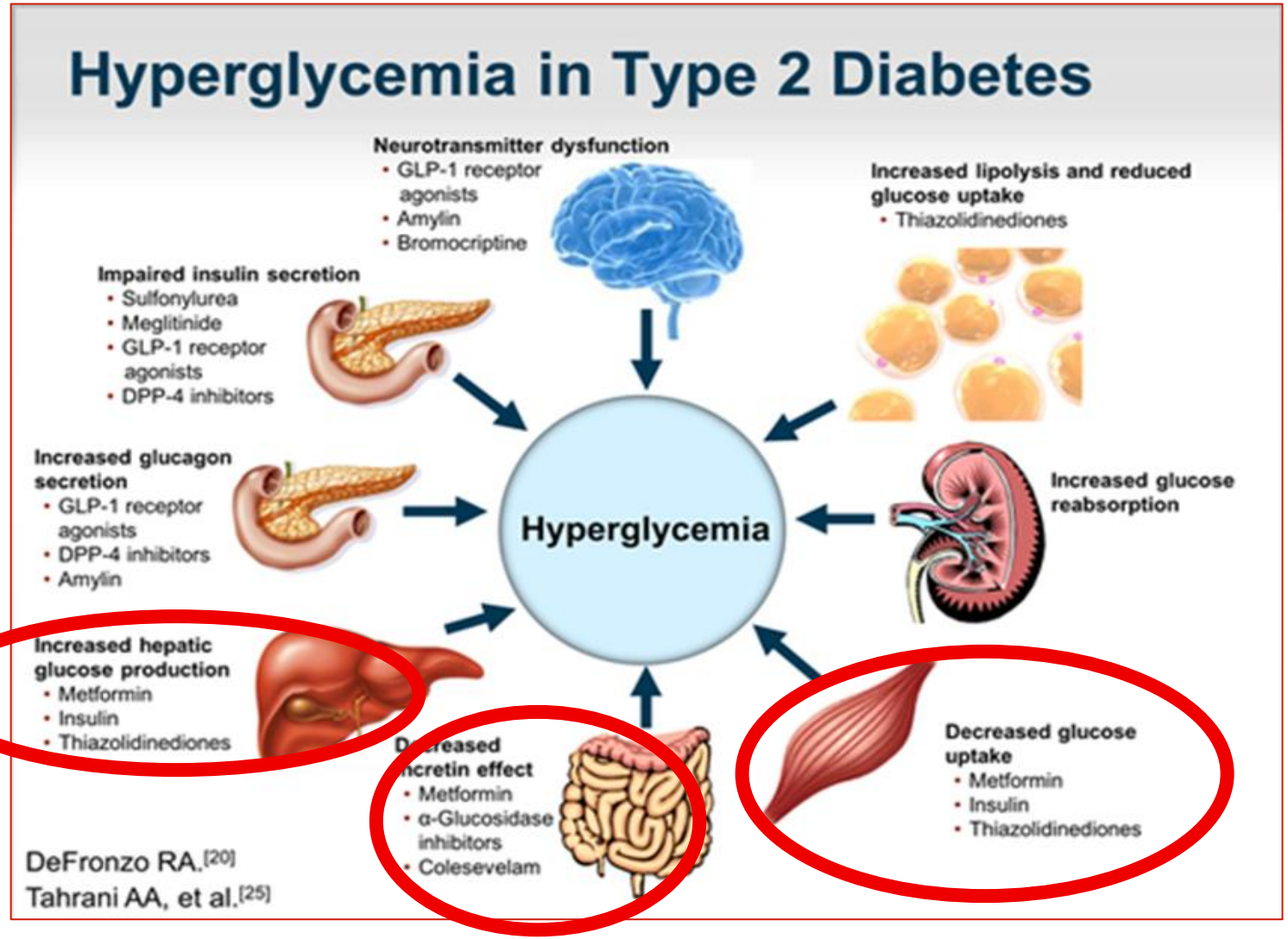
Treatment



? Metformin

Metformin, GLP-1 RAs, SGLT-2 inhibitors, insulin
Other oral meds
Bariatric surgery

Metformin


Hyperglycemia in Type 2 Diabetes
Neurotransmitter dysfunction
• GLP-1 receptor agonists
• Amylin
• Bromocriptine
Increased lipolysis and reduced glucose uptake
• Thiazolidinediones
Impaired insulin secretion
• Sulfonylurea
• Meglitinide
• GLP-1 receptor agonists
• DPP-4 inhibitors
Increased glucagon secretion
• GLP-1 receptor agonists
• DPP-4 inhibitors
• Amylin
Hyperglycemia
Increased glucose reabsorption
Increased hepatic glucose production
• Metformin
• Insulin
• Thiazolidinediones
Decreased incretin effect
• Metformin
• α-Glucosidase inhibitors
• Colesevelam
Decreased glucose uptake
• Metformin
• Insulin
• Thiazolidinediones
DeFronzo RA.[20]
Tahrani AA, et al.[25]

Metformin

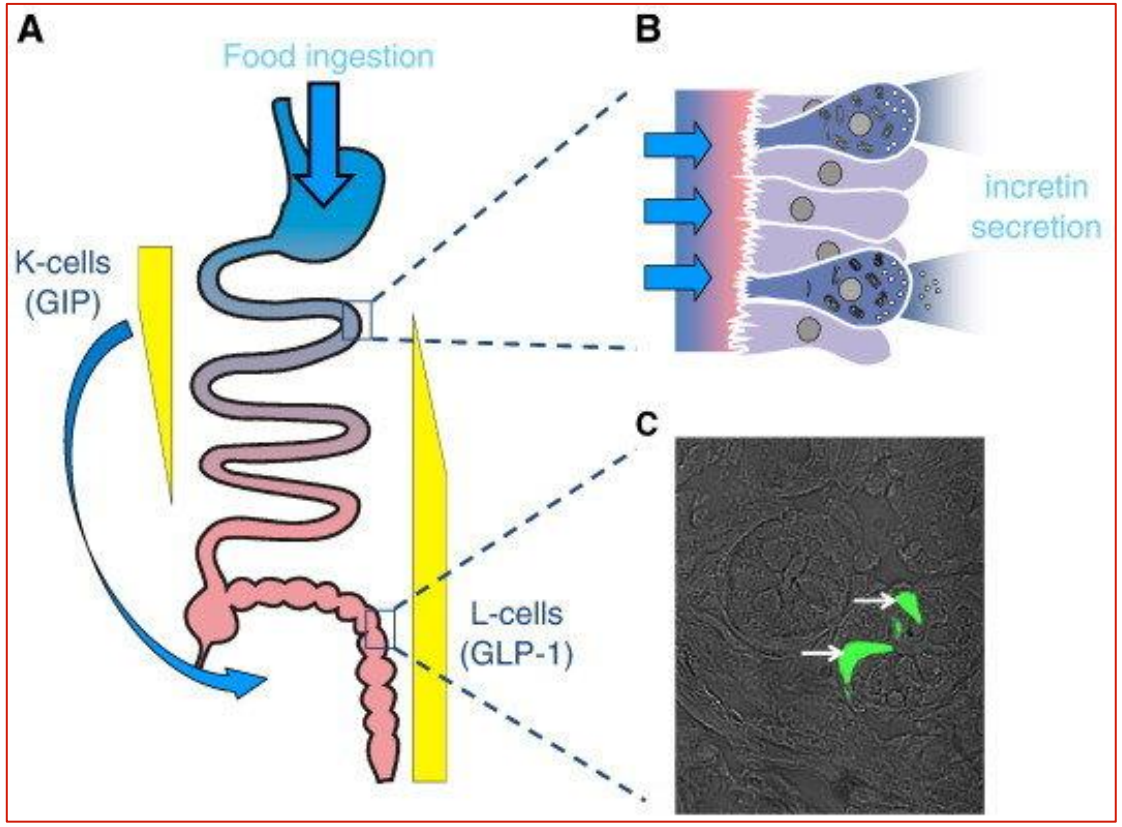
- Recommended as first line therapy
- GI side effects

- Loss of glycemic control in 50% of adolescents if used as monotherapy





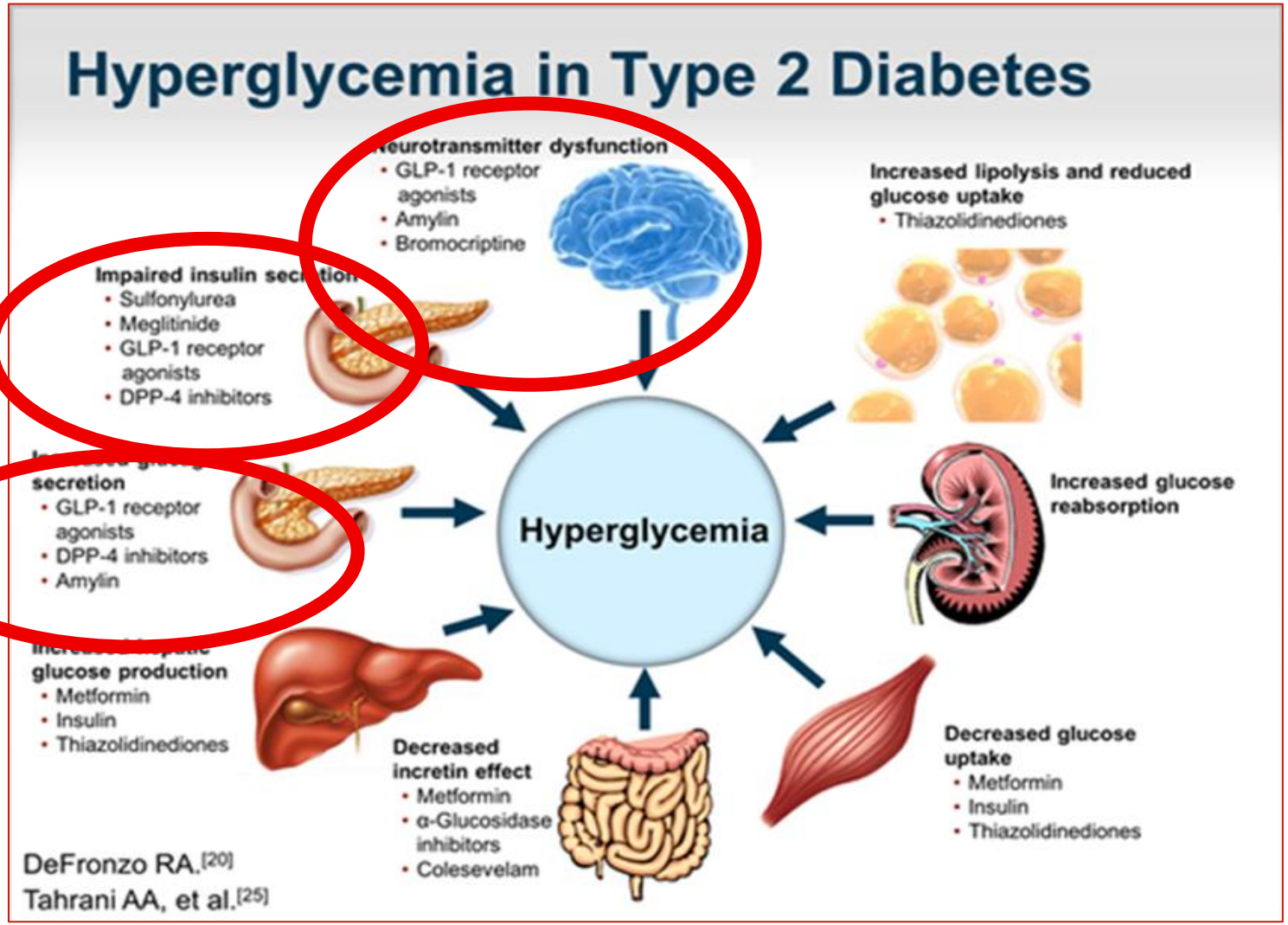
Incretins: GLP-1, GIP



- Glucagon-like peptide 1 (GLP-1)
- Glucose-dependent insulinotropic polypeptide (GIP)

- “Incretins" link the absorption of nutrients from the GI tract with pancreatic hormone secretion: insulin, glucagon

Incretins: GLP-1, GIP

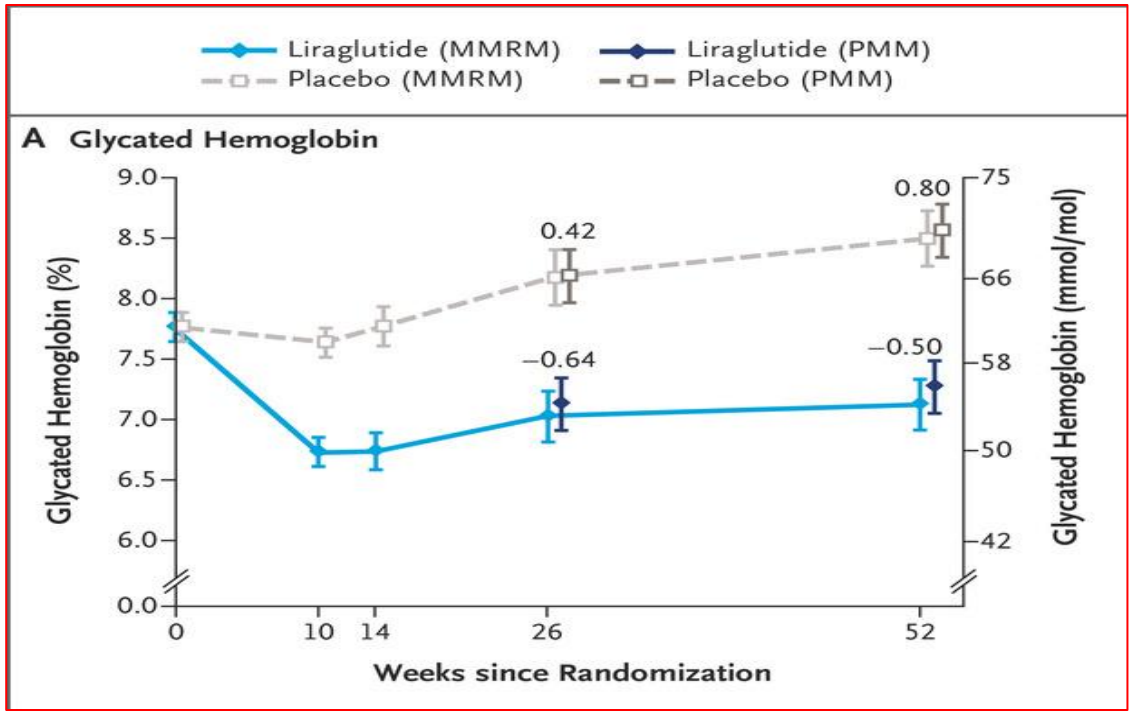


GLP-1 RA - Side effects

- Nausea, vomiting, abdominal pain
  - Wanes with duration of therapy
  - Can be reduced with dose titration
- No deaths were reported during the trials
- Pancreatitis

Liraglutide in Children and Adolescents with Type 2 Diabetes

Daily SC injection

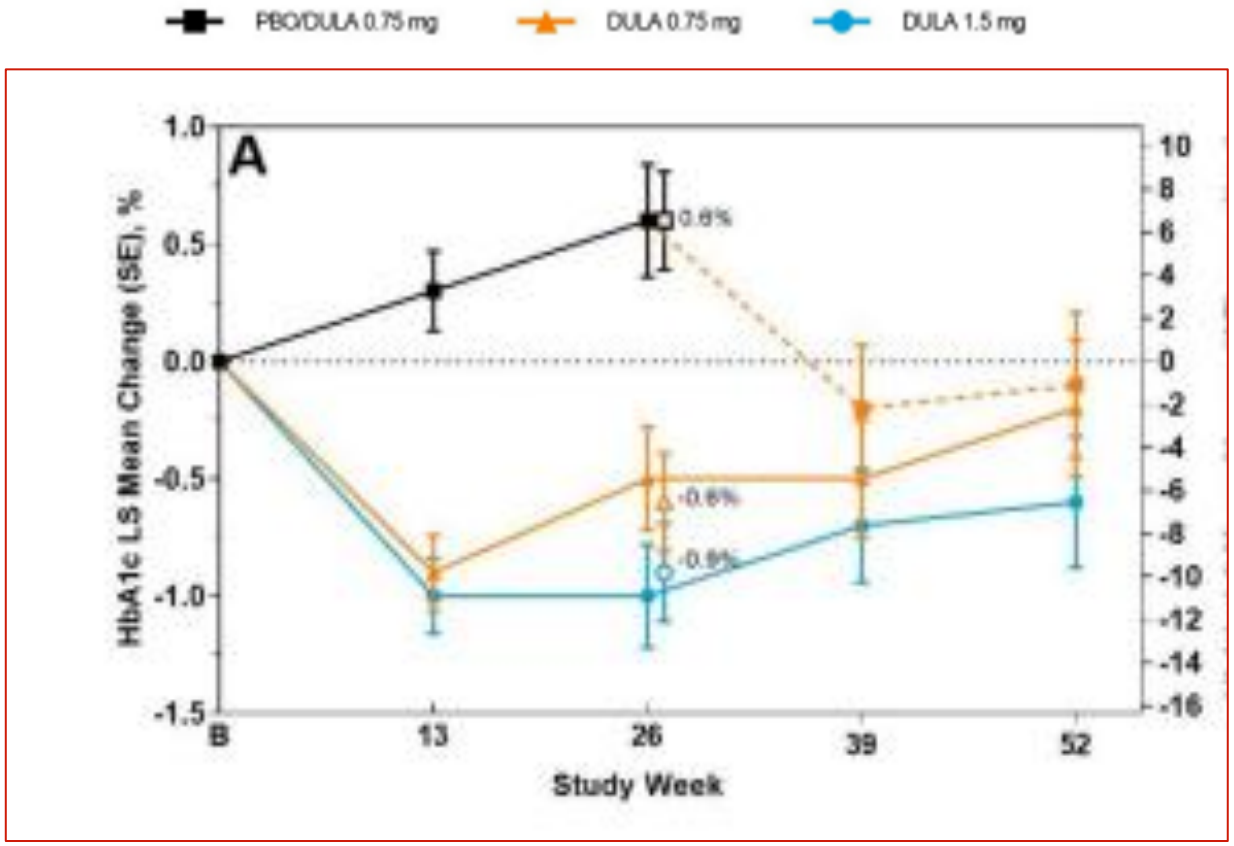


At 26-weeks Mean HbA1c:

- Treatment difference vs placebo:
  - −1.0% at 26 wk
  - −1.3% at 52 wk

WV Tamborlane et al. N Engl J Med 2019;381

Once-Weekly Dulaglutide for the Treatment of Youths with Type 2 Diabetes AWARD-PEDS

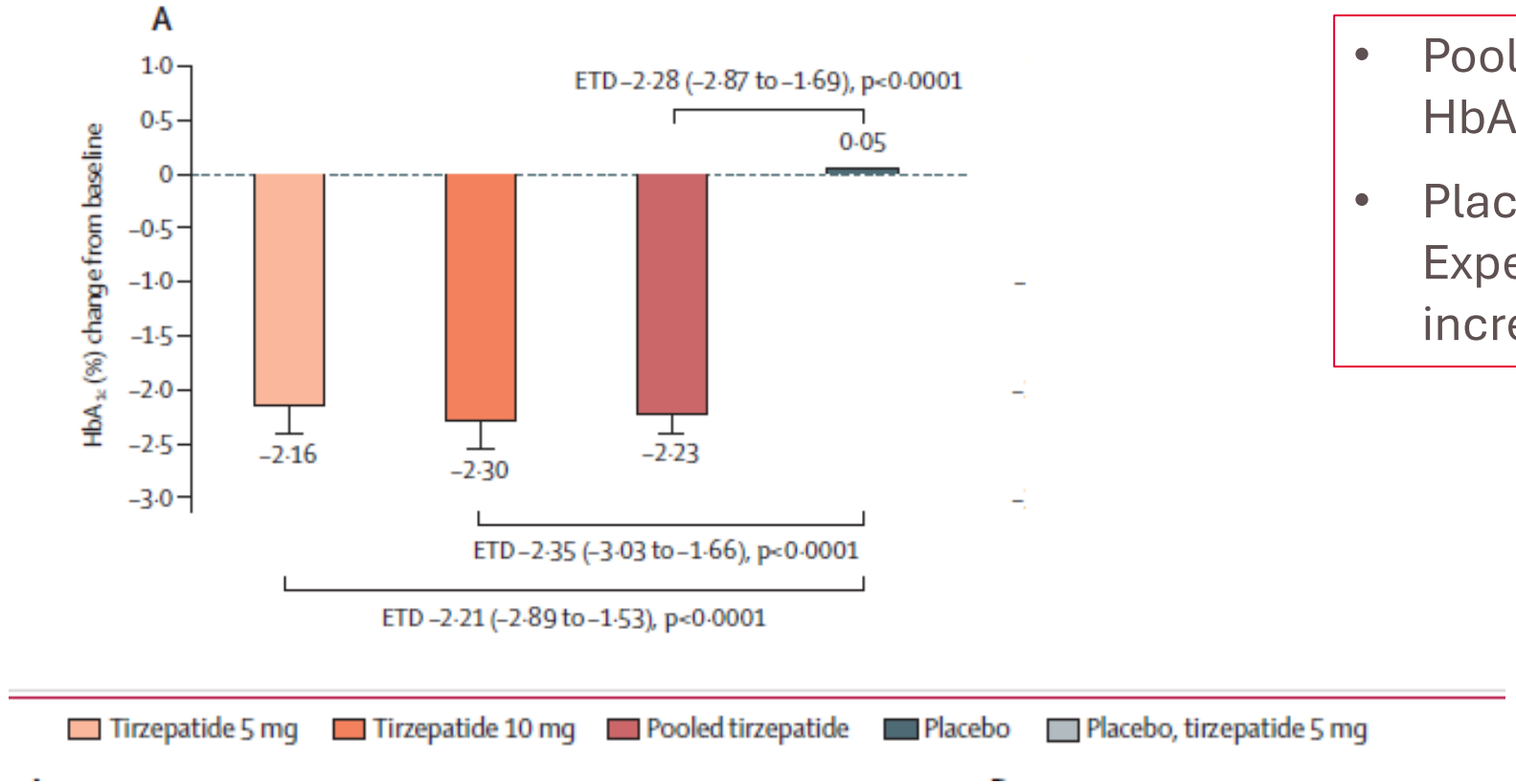


- 26-week trial, randomized and 26-week open-label extension
- Once-weekly injections placebo, dulaglutide 0.75 mg, or 1.5 mg

Arslanian, et al - NEJM June 2022

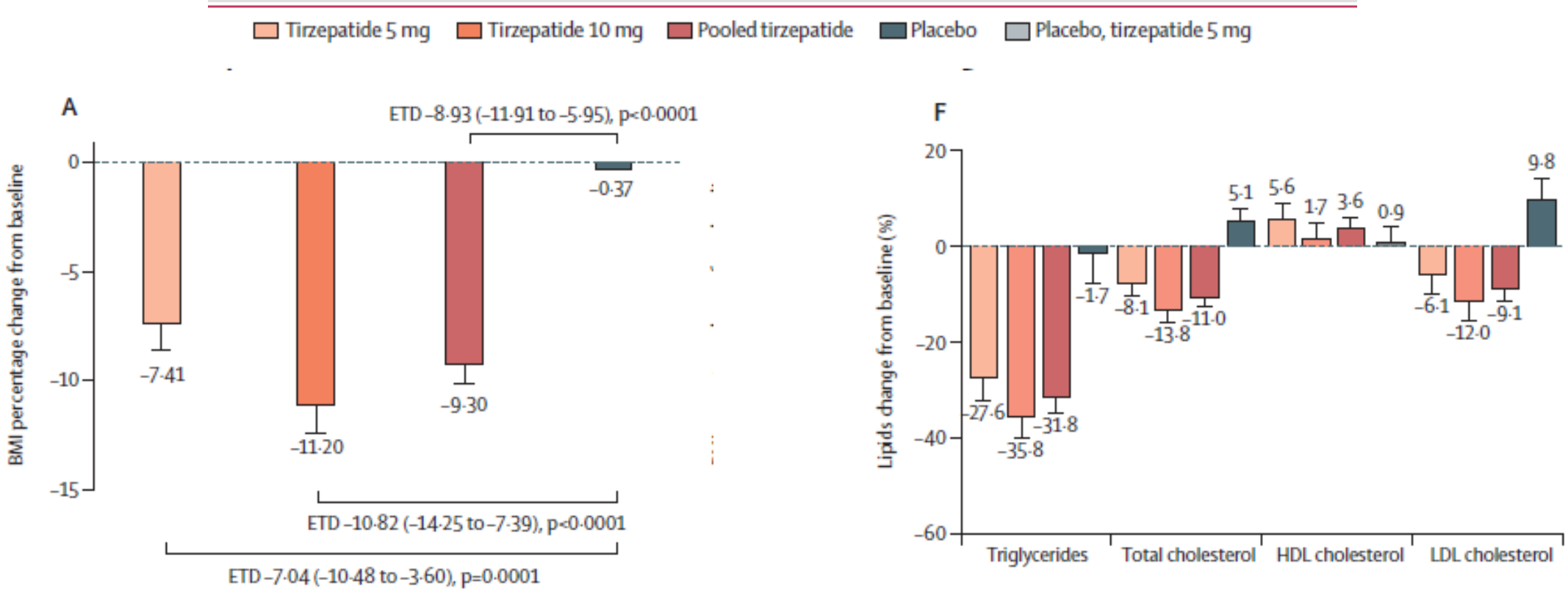
Tirzepatide. SURPASS-PEDS Randomized Trial

10 -18 years old with youth-onset type 2 diabetes



- Pooled Tirzepatide Group: HbA1c decrease of 2.23%
- Placebo Group: Experienced a slight increase of 0.05%.

Lancet 2025; 406: 1484-96



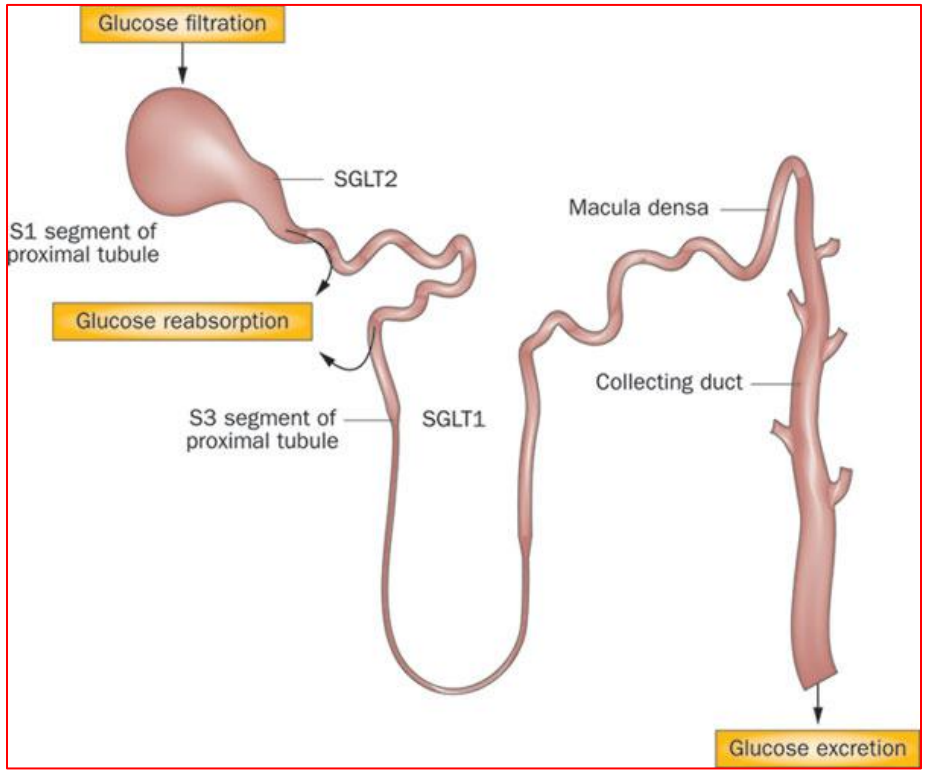
Lancet 2025; 406: 1484–96

Semaglutide

- Weekly injectable approved for weight management (>12y)

- PIONEER TEENS study: 10 to 17 years old with T2DM
  - 52-week randomized trial
  - positive results reported: reduced HbA1c by 0.83% vs placebo
- Awaiting regulatory approval

SGLT-2 Inhibitors: kidney sodium-glucose transporter



Induces glycosuria

Empagliflozin

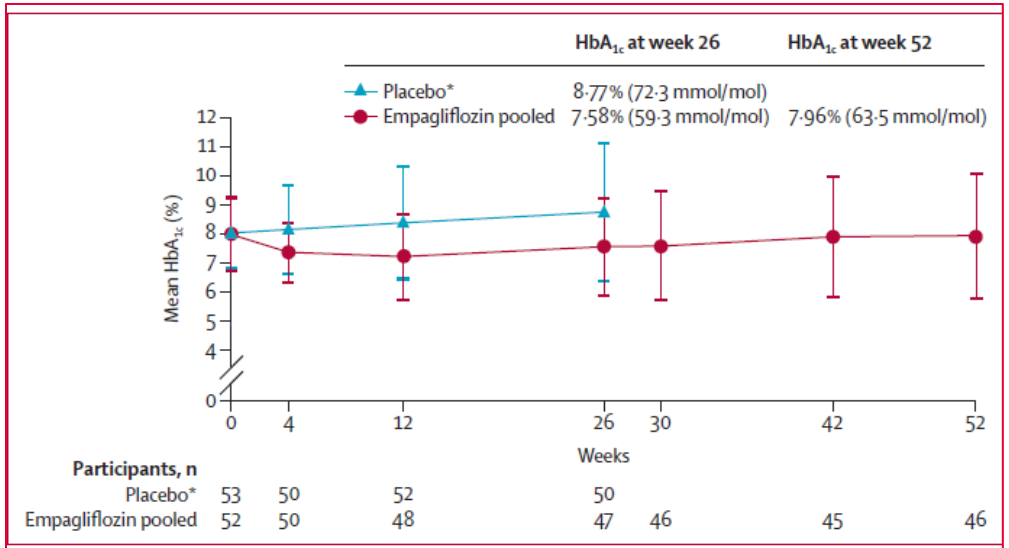


Figure 2: **Change in HbA_{1c} from baseline to week 26**
Descriptive data reflecting mean HbA_{1c} over time from baseline to week 52 for empagliflozin versus placebo in the modified intention-to-treat population. Error bars denote SDs. *Placebo treatment stopped at week 26.

- HbA1c change at week 26 was –0·84%
- Reasonable choice for second or third-line therapy
- Approved >12y

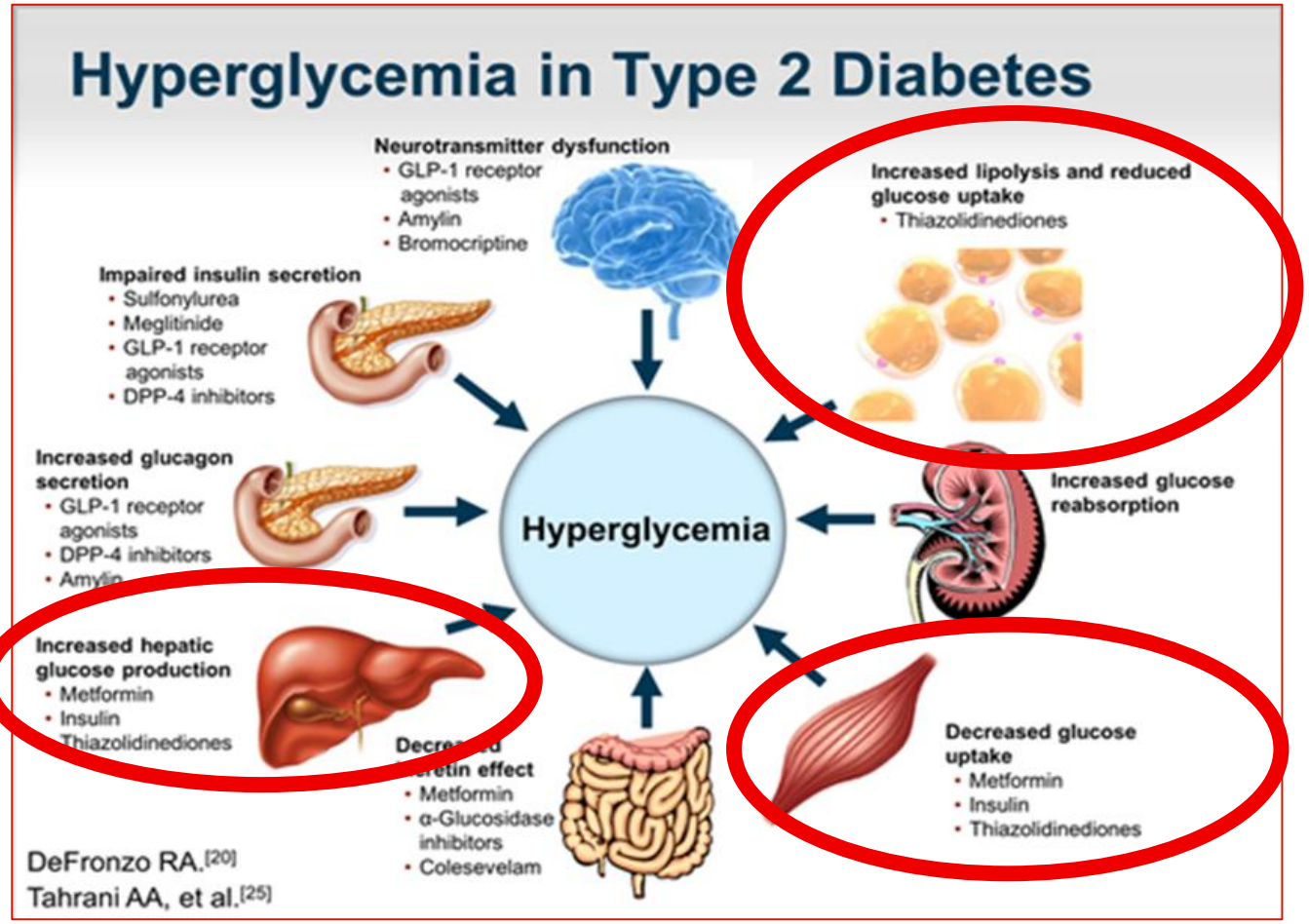
- Additional effects:
  - Mild weight loss
  - Lowers blood pressure
  - Hypoglycemia

Lancet Diabetes Endocrinol 2023; 11: 169–81

SGLT-2 Inhibitors - side effects

- Vaginal candidiasis
- UTI
- Hypovolemia
- Euglycemic DKA
    - Ketoacidosis
    - No hyperglycemia

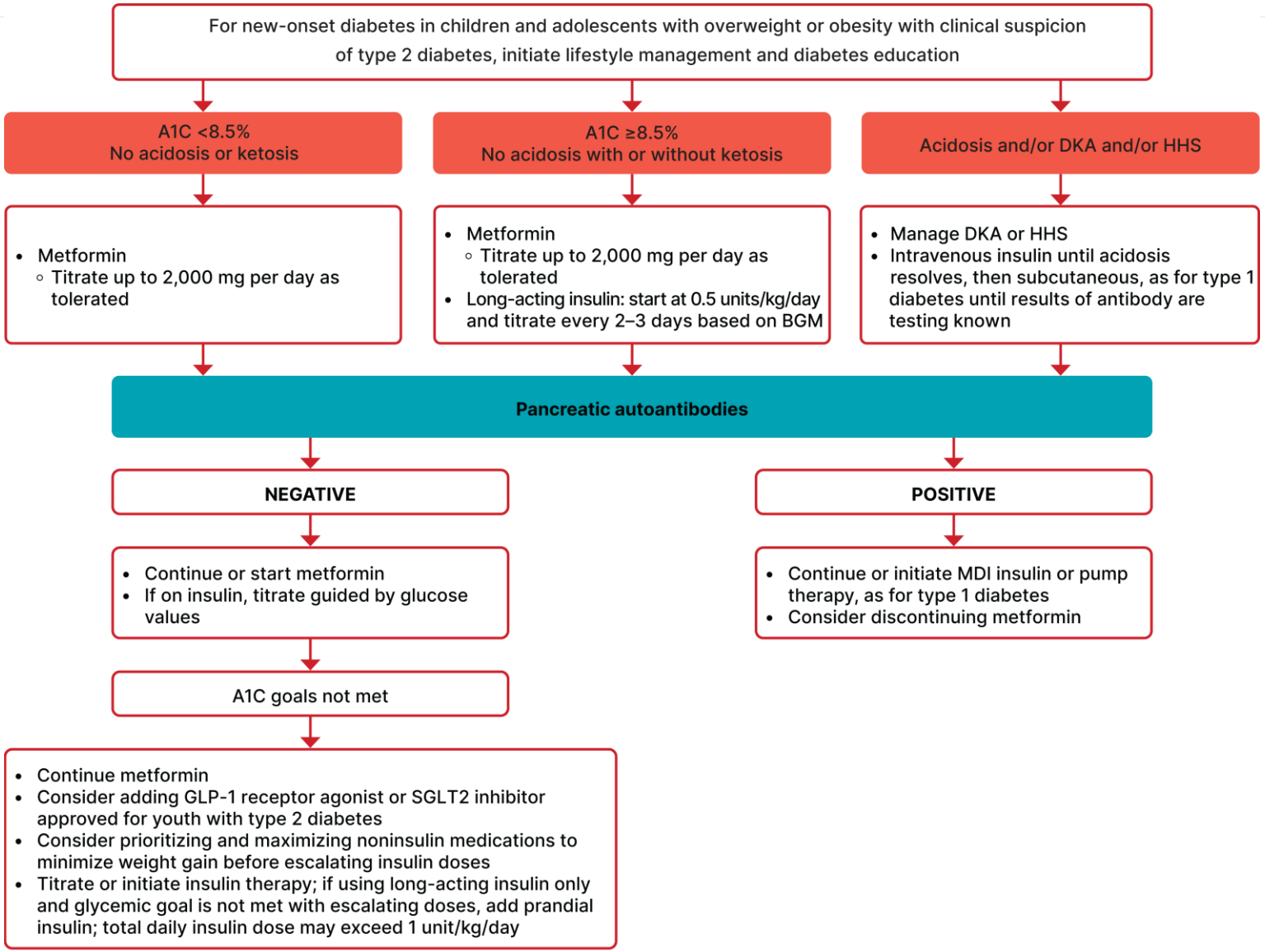
Thiazolidinediones (TZDs or Glitazones)



Thiazolidinediones (pioglitazone) – not FDA approved

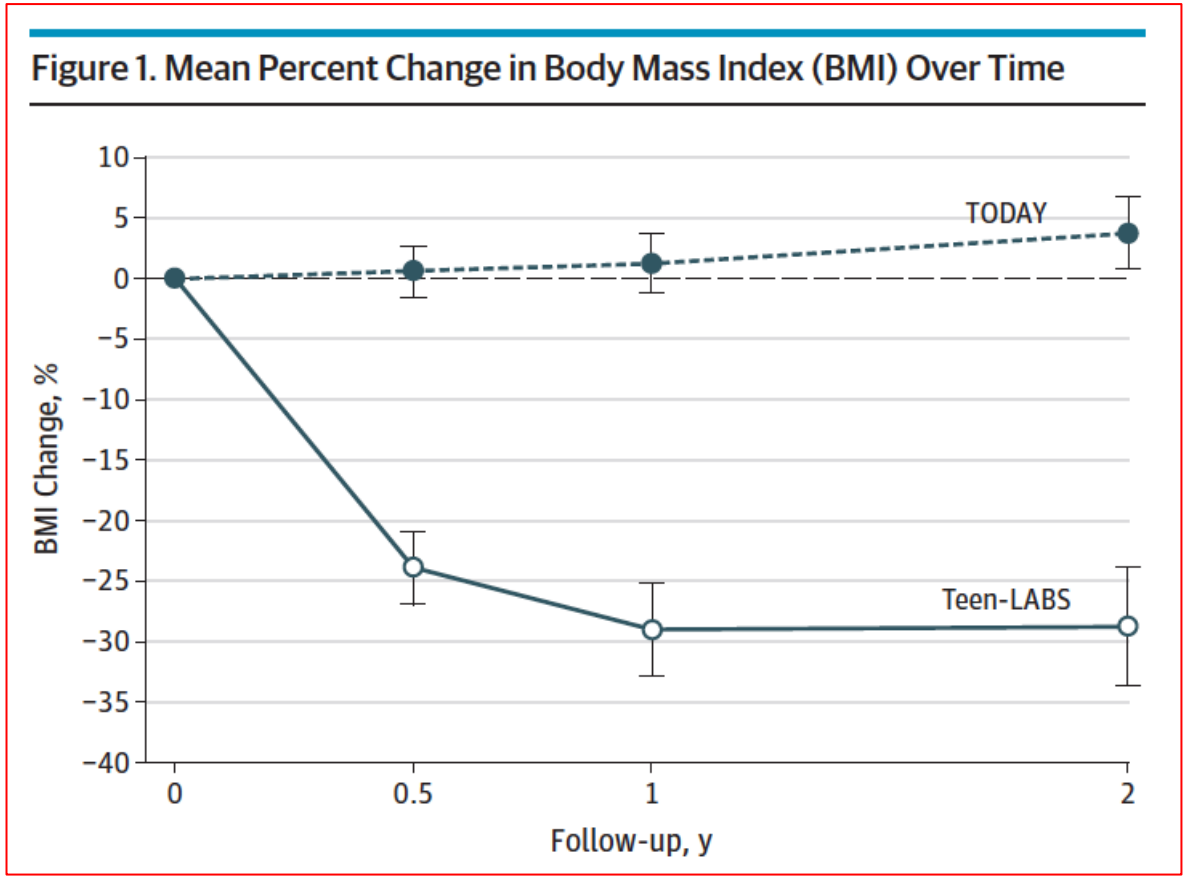
- No clinical trials with pioglitazone. Rosiglitazone used in TODAY study
- Change in HbA1C -1.0 to -1.6 %
- Second/third line therapy
- Inexpensive
- Side effects: weight gain, hypoglycemia if combined with other agents

American Diabetes Association Standards of Care 2026



Diabetes Care. 2025;49 (Supplement1)

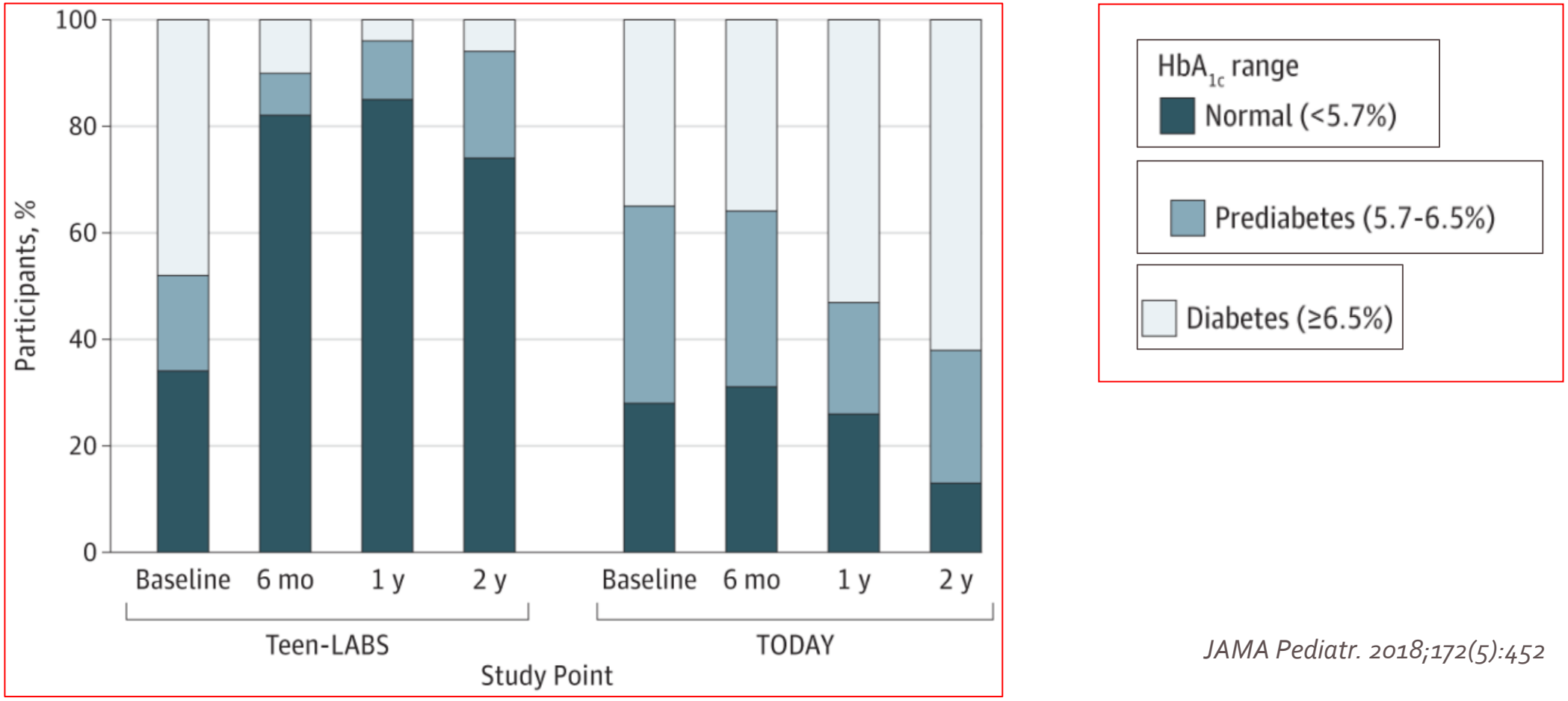
Bariatric Surgery – Metabolic Surgery



- TODAY:
  Lifestyle and oral medications
- Teen-LABS:
  Bariatric surgery

JAMA Pediatr. 2018;172(5):452

Changes in HbA_1c



JAMA Pediatr. 2018;172(5):452

Summary

- Type 2 diabetes in youth is increasing
- It is a rapidly worsening disease
- High risk of developing complications within 5-10 years
- Screening for type 2 diabetes is risk-based
- Initial ease of management with metformin can give a false sense of security, often causes patients and health care providers to underestimate the disease



Children's National®

Thank you

Prescribing Nutrition: The Evolution of Food Is Medicine

Alicia Tucker, MD, FAAP, DiplABOM
Attending Pediatrician, IDEAL Clinic
Director of the GWU Culinary Medicine Program



September 18th, 2026

Children's National

Continuing Education – Learner Notification

Two Decades of Progress: Advancing Pediatric Obesity Care
September 18th, 2026

Notice of Requirement for Successful Completion

Participants may earn CE credit for this activity by attending the entire education session and completing the required evaluation. Instructions for claiming CE credit, including the attendance code, will be provided at the conclusion of the activity.

Nurses: Children's National Hospital designates this live activity for a maximum of 5.0 ANCC contact hours for nurses. Nurses should claim only the credit commensurate with the extent of their participation in the activity.

Physicians: Children's National Hospital designates this live activity for a maximum of 5.0 AMA PRA Category 1 Credits™ for physicians. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Pharmacists: Children's National Hospital is accredited by the Accreditation Council for Pharmacy Education (ACPE) as a provider of continuing pharmacy education. This program meets ACPE criteria for 5.0 contact hours.

Psychologists: Continuing Education (CE) credits for psychologists are provided through the co-sponsorship of the American Psychological Association (APA) Office of Continuing Education in Psychology (CEP). The APA CEP Office maintains responsibility for the content of the programs. Children's National Hospital designates this live activity for a maximum of 5.0 CE credits (Instructional Level: Intermediate Learning).

IPCE: This activity was planned by and for the healthcare team, and learners will receive 5.0 Interprofessional Continuing Education (IPCE) credit for learning and change.

Relevant Financial Relationships

The planning committee and presenters have no relevant financial relationships with ineligible companies.

Financial and In-Kind Commercial Support

No financial nor in-kind commercial support was received for this education activity.

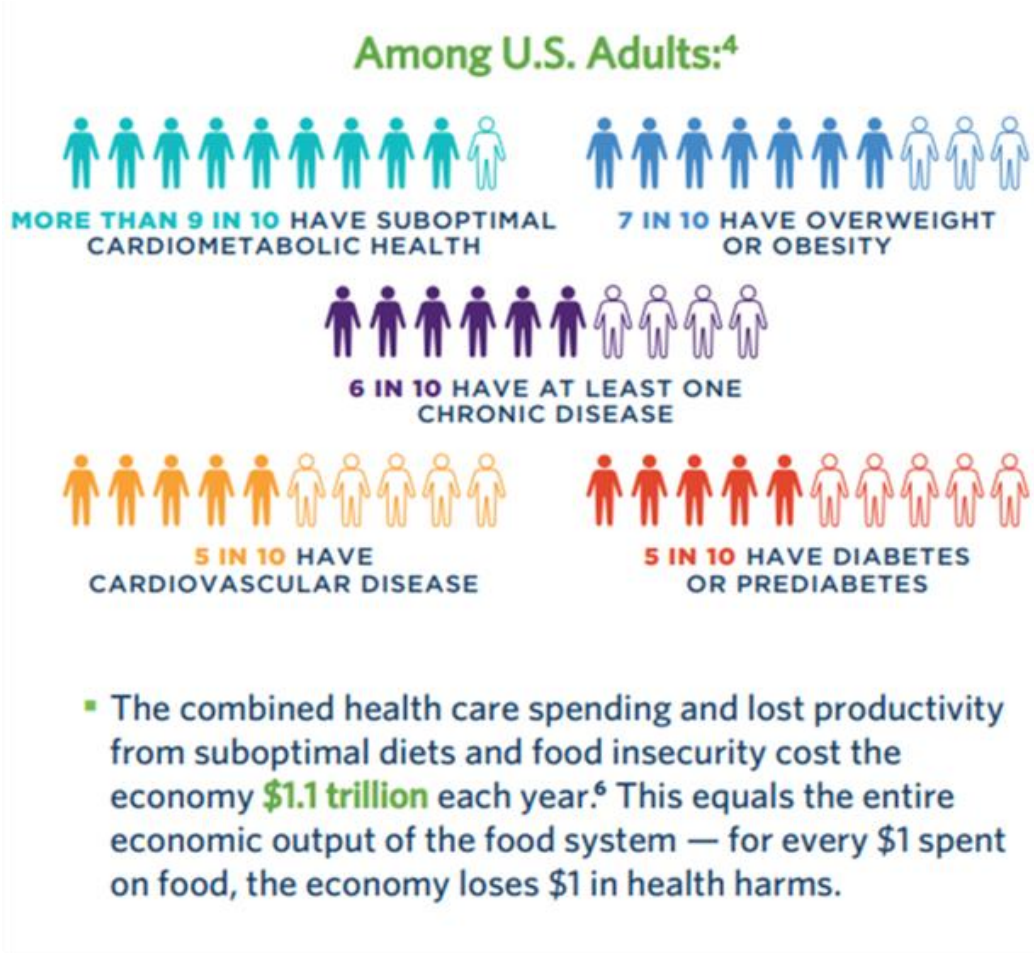
JOINTLY ACCREDITED PROVIDER™ INTERPROFESSIONAL CONTINUING EDUCATION

In support of improving patient care, Children's National Hospital is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team. Children's National Hospital Accreditation Provider# 4008362.

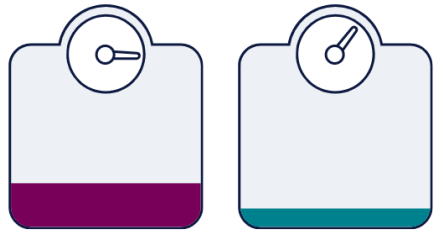
1. Review the current rates of diet-related disease and food insecurity
2. Describe the paradigm shift from a focus on food security to nutrition security and food-based interventions
3. Review examples of current food is medicine interventions at CN
4. Consider ways to build more sustainable food is medicine programming through systemic change



The burden of diet-related disease in the US



Rates of obesity among children and adolescents 2-19yo



25.6%

Family income **between 100 and 199 percent of poverty guidelines**

10.5%

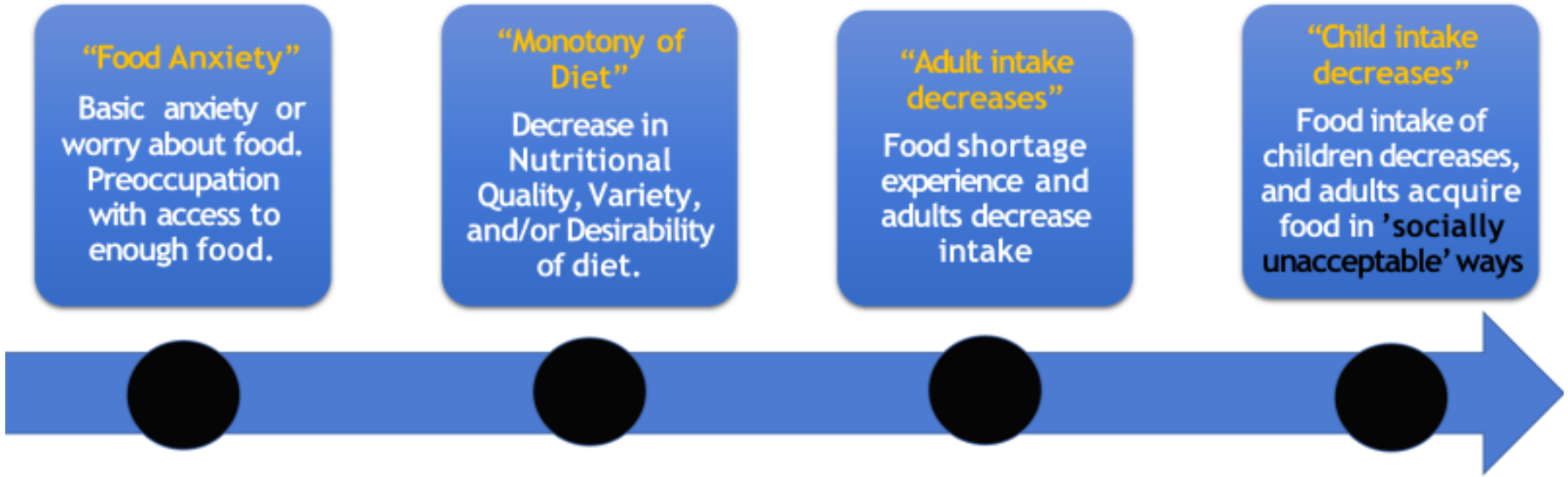
Family income **of 400 percent or more of poverty guidelines**

Highest group rate was **more than twice** the lowest group rate.

Centers for Disease Control and Prevention. https://www.cdc.gov/heartdisease/facts.htm. Accessed July 5, 2018.

Food Insecurity: the lack of consistent economic access to enough calorie-sufficient food for an active, healthy life

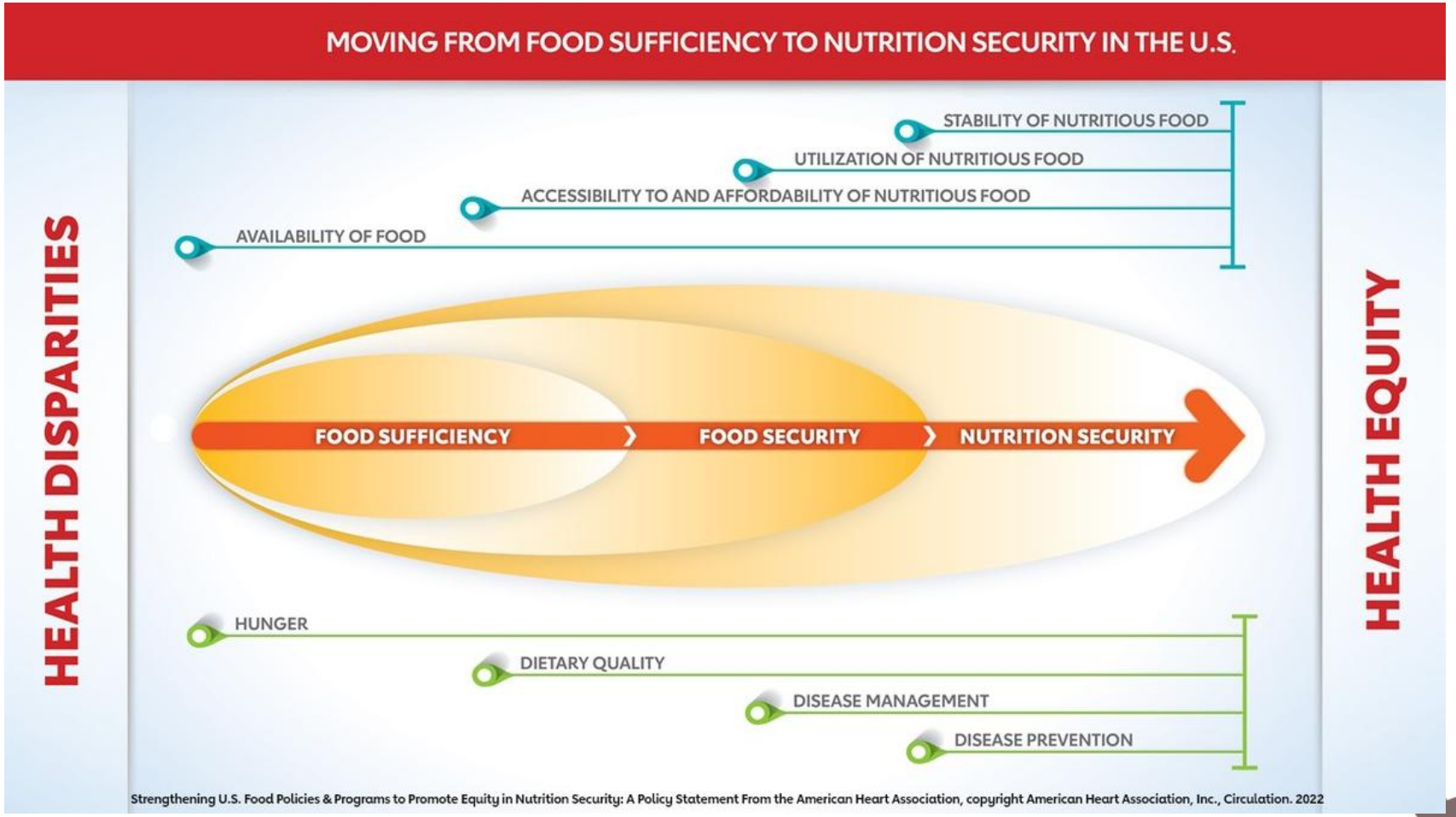
Lived Experiences of Food Insecure Households



Nord, J Hunger Env Nut, 2013; Fram et. al, J Nutrition, 2011; Alaimo, Top Cli Nut, 2005; Essel et. al, Springer 2018

Children's National

Nutrition insecurity: the lack of consistent access to safe, high-quality, and nutrient-dense foods necessary to promote optimal health and prevent chronic disease.



Children's National

Lived Experience of Food Insecurity

If you are trying to prevent hunger and limit waste, what meal would you choose?

COST
$10/meal



Highly palatable
Quick and easy
Kids will rarely refuse
Dopamine

COST
$5/meal

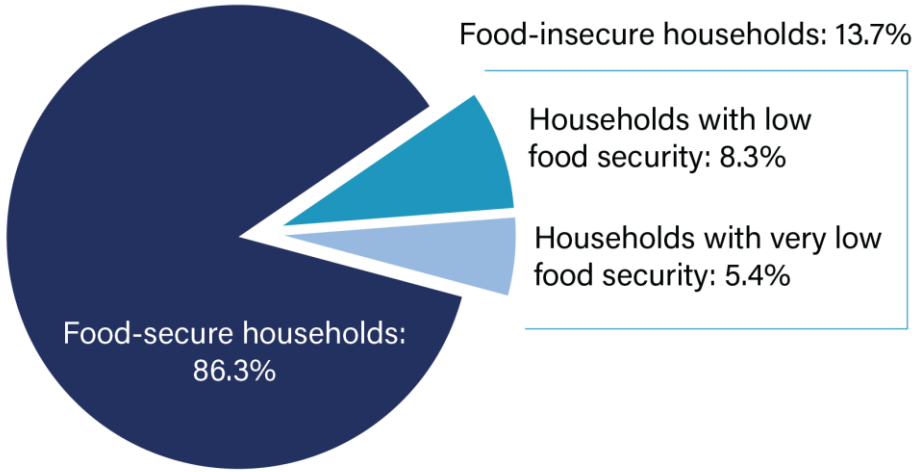


Requires time and tools
Planning ahead
Requires knowledge and skill
Potential waste if kids refuse it

Children's National

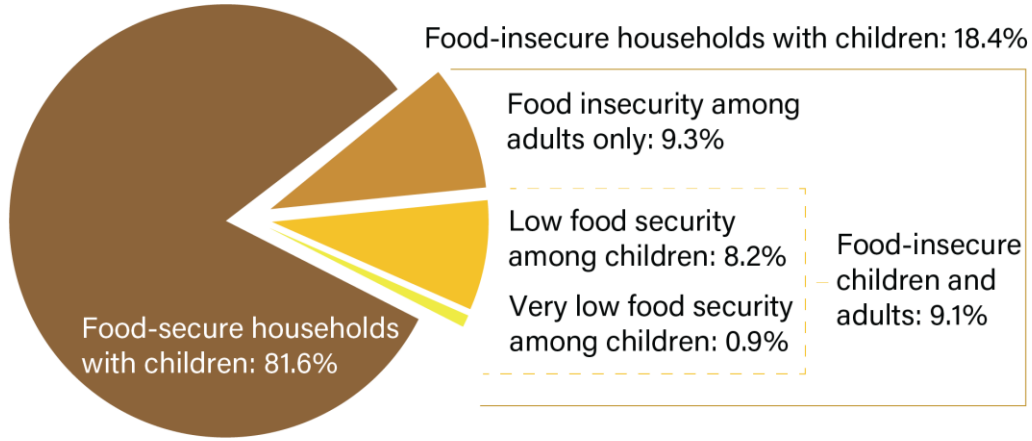
National Food Insecurity Data: 2024 USDA Report

U.S. households by food security status, 2024



Source: USDA, Economic Research Service using U.S. Department of Commerce, Bureau of the Census, 2024 Current Population Survey Food Security Supplement data.

U.S. households with children by food security status of adults and children, 2024

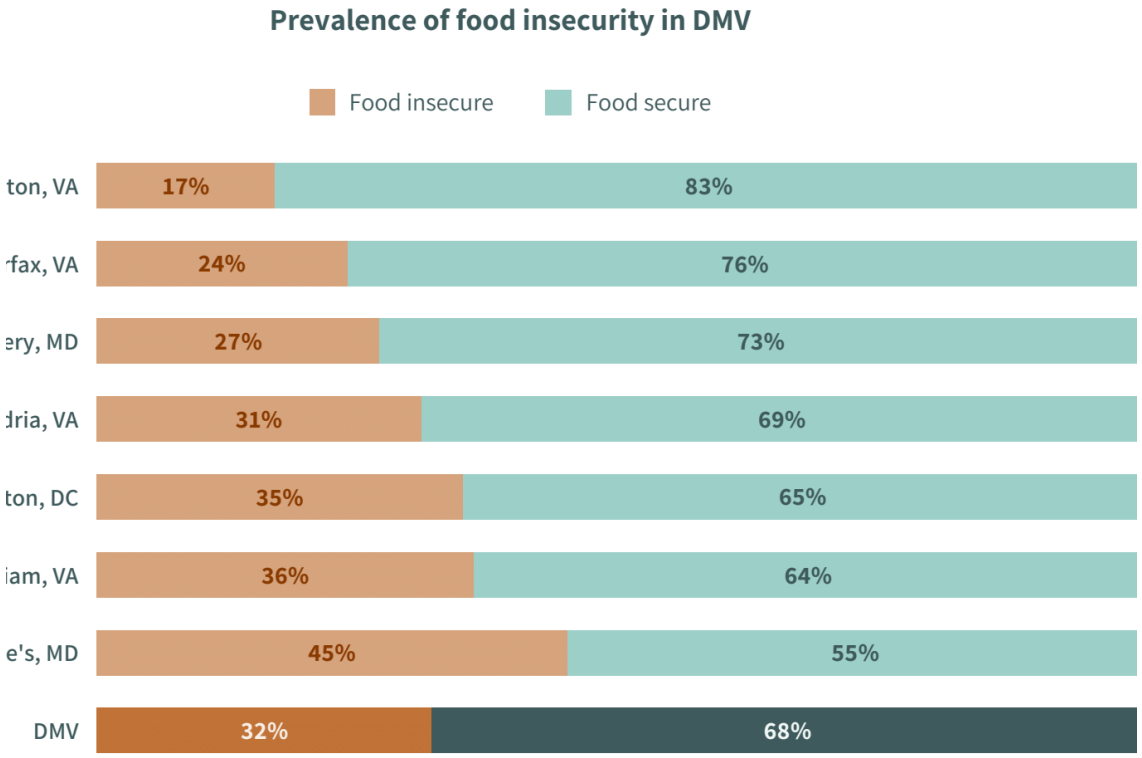


Note: The food security survey measures food security status at the household level. Not all individuals in a household are affected equally by the households' food insecurity. However, in most households where the child is food insecure, the adults also experience food insecurity.

Source: USDA, Economic Research Service using U.S. Department of Commerce, Bureau of the Census, 2024 Current Population Survey Food Security Supplement data.

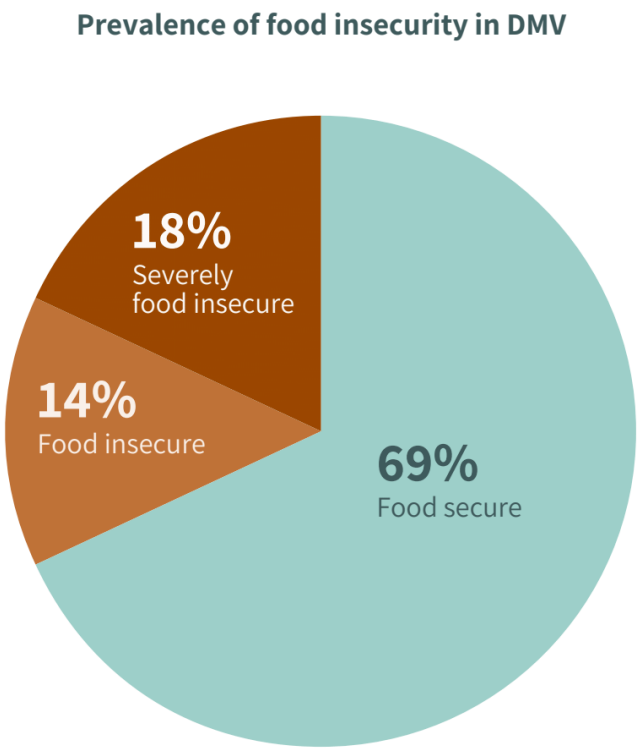
Children's National

What are numbers here in the DMV?



Question: USDA eighteen-item screener for food insecurity between May 2022 and April 2023

apital Area Food Bank Survey conducted conducted May 1-15, 2023, with 5,261 adults age 18 and older in the D.C. Metro Area

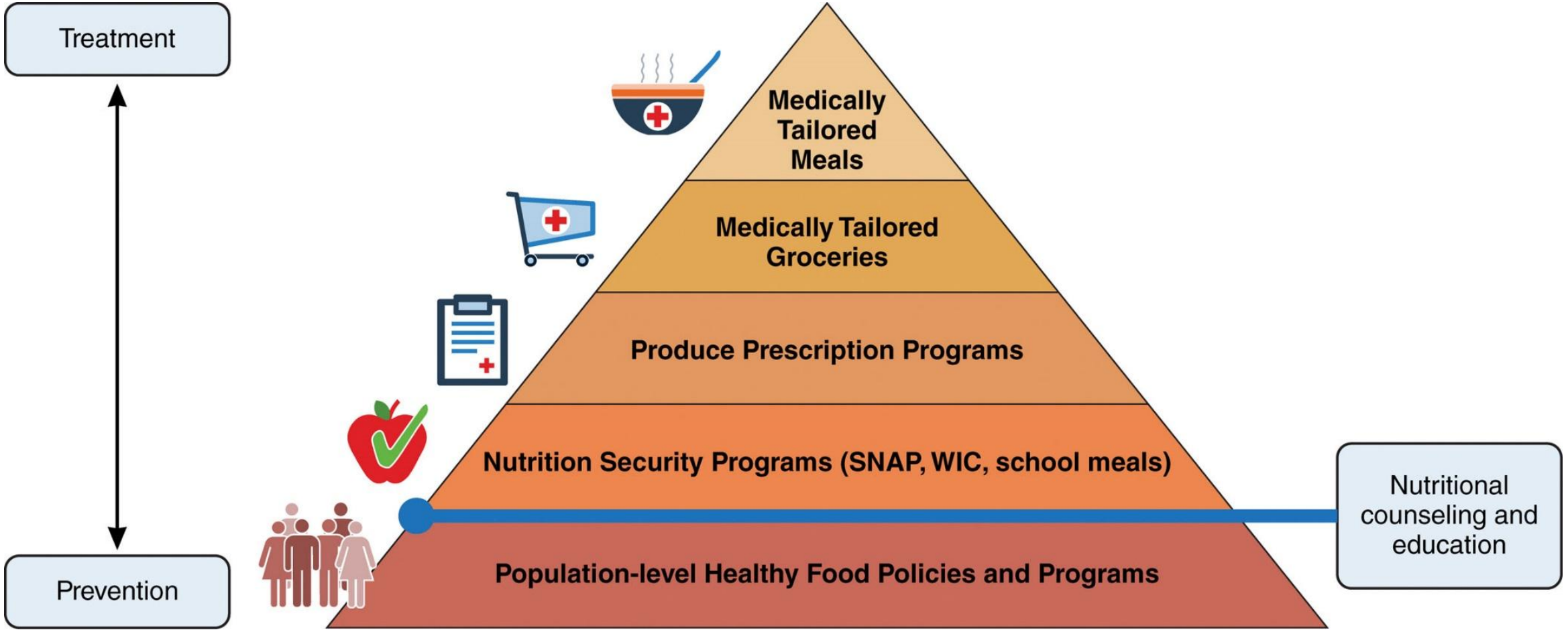


Question: USDA eighteen-item screener for food insecurity between May 2022 and April 2023

Source: Capital Area Food Bank Survey conducted conducted May 1-15, 2023, with 5,261 adults age 18 and older in

Children's National

Seeing how nutrition insecurity intersects with health outcomes shows us where we can intervene



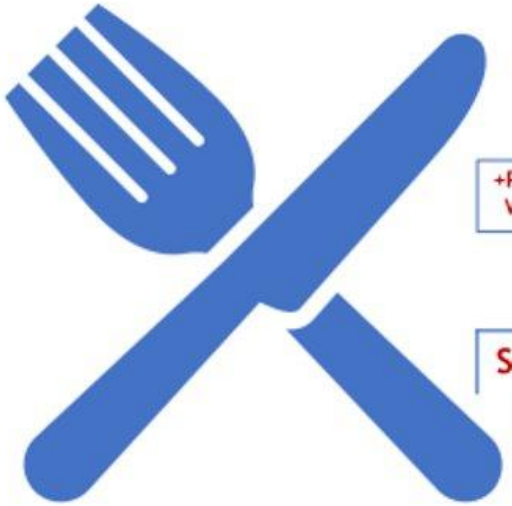
Children's National

Population Health and Policy Considerations



Federal food assistance provides the strongest safety net

Federal Nutrition Programs

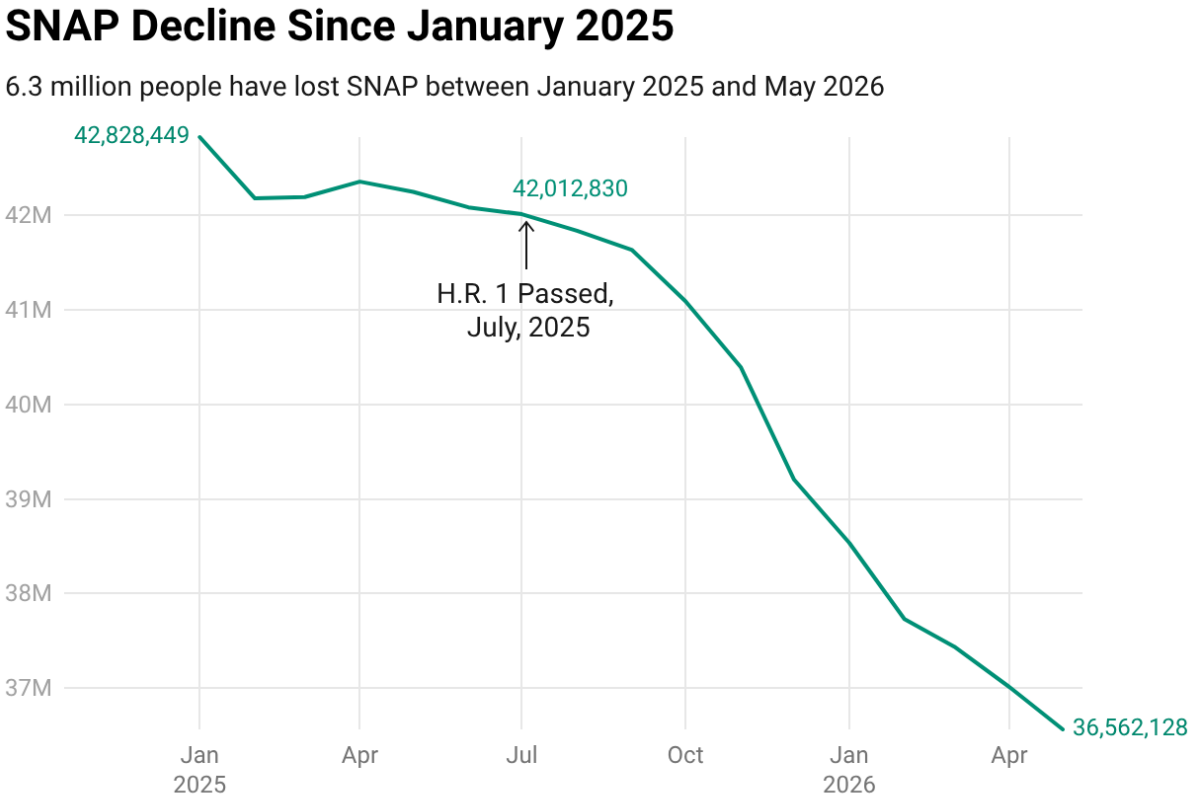


All Ages		• Supplemental Nutrition Assistance Program (SNAP)/ Food Stamps
+Pregnant Women	0-5yo	• Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
School Age		• School Breakfast & Lunch
School Age; 0-18yo		• Summer Meals
Daycare/School		• Child & Adult Care Food Program(CACFP) (includes After School Meals)
Seniors		• Commodity Supplemental Food Program(CSFP)
		• The Emergency Food Assistance Program

Children's National

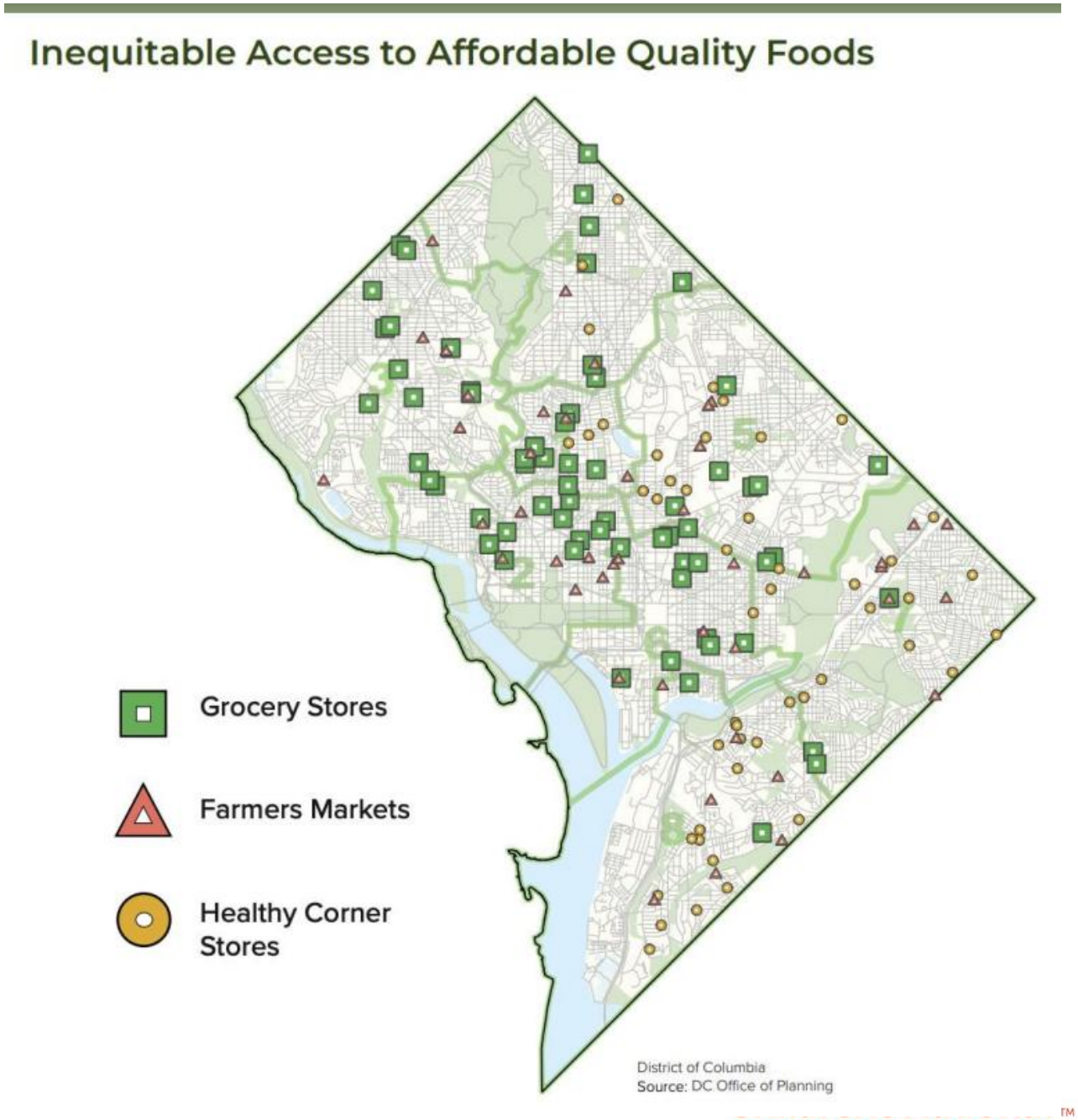
Policy Decisions Drive Dramatic Decline in SNAP Participation

The budget reconciliation law (H.R. 1) cut SNAP and introduced new provisions including more restrictive work requirements. One year later, over 5 million people have lost access

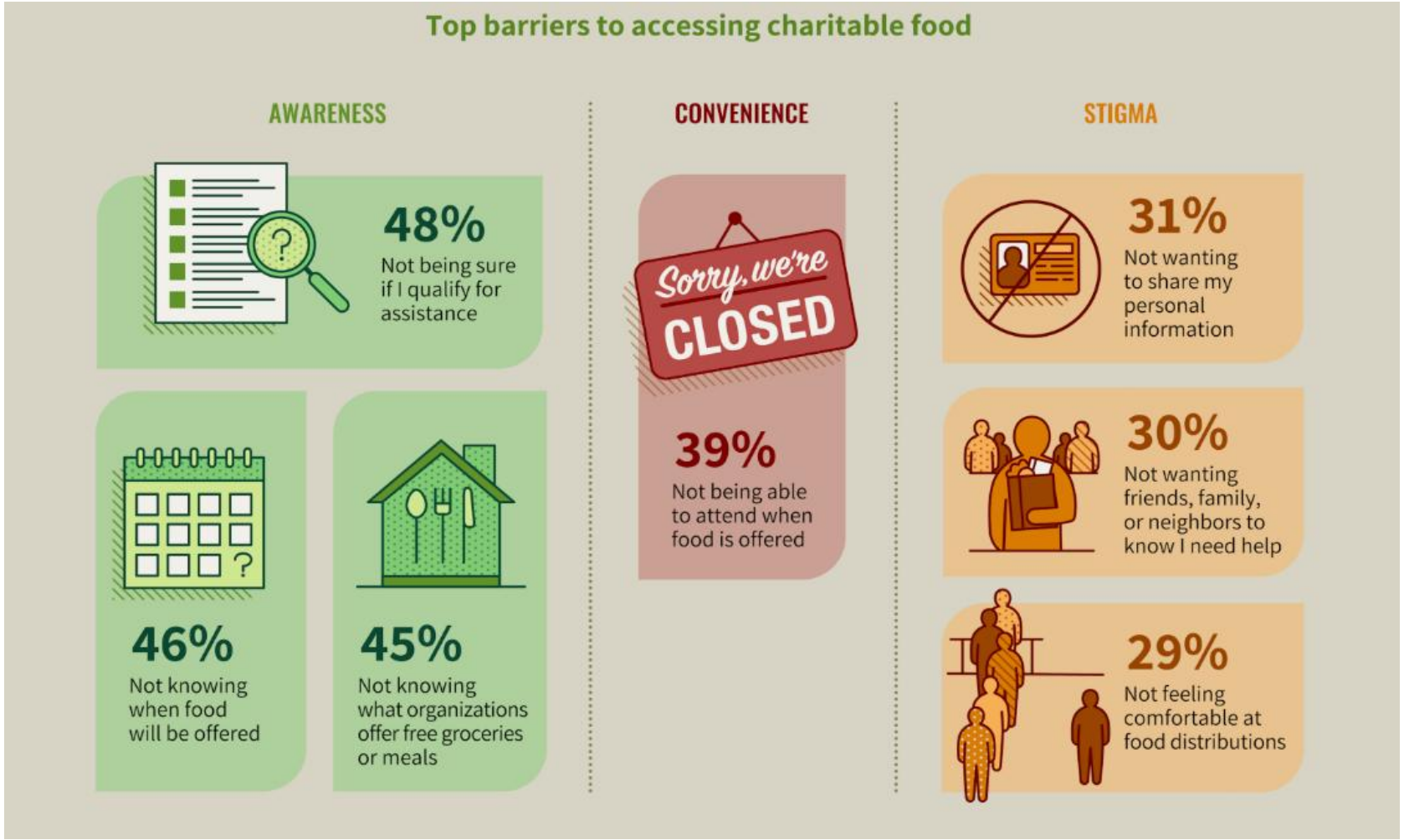


Children's National ™

What is the infrastructure? Where are people shopping?

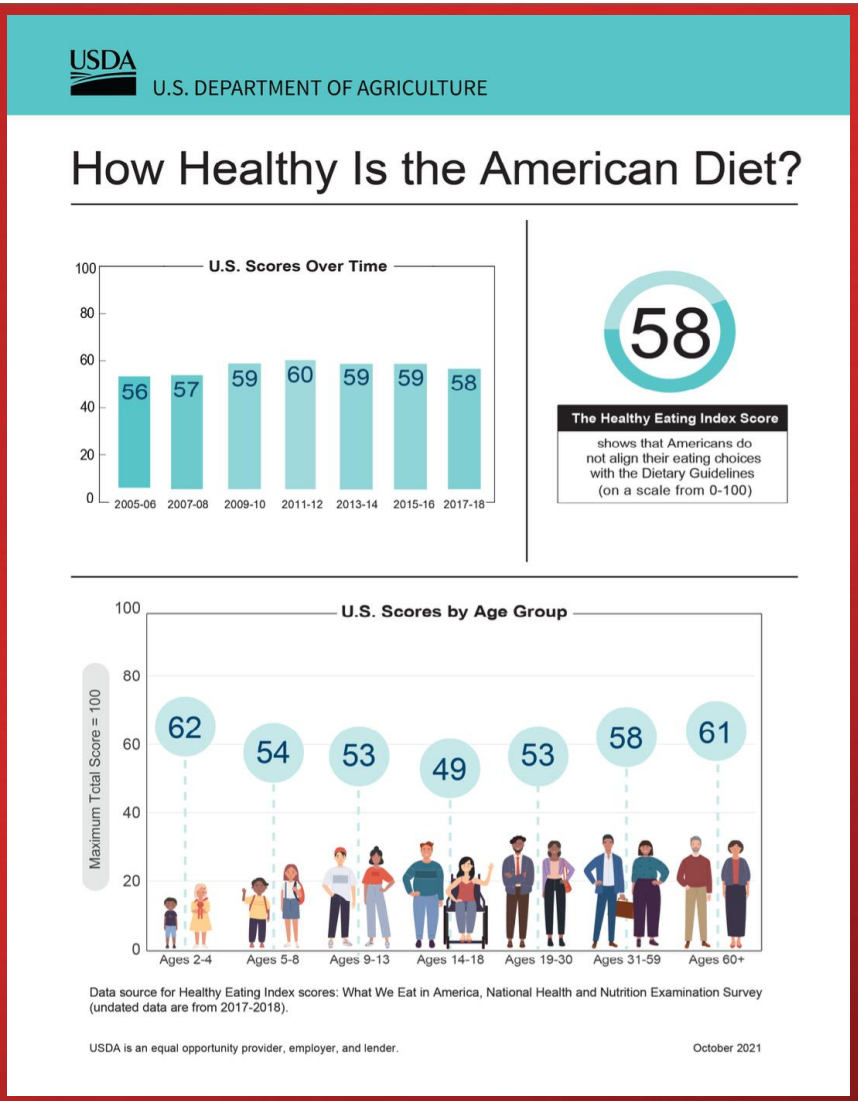


Food banks fill a critical need but organizations are limited by donor funding and those that need it the most may have limited access



Children's National

But there's more going on then just being able to afford food



Children's National

Produce consumption in the US population

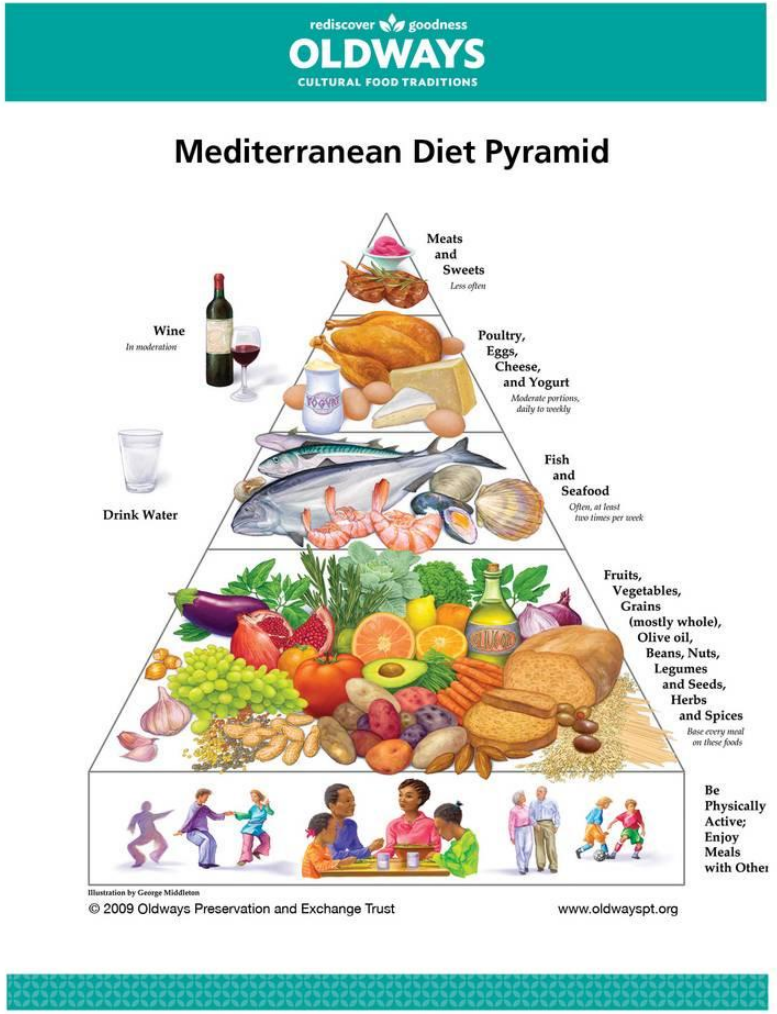
- The average American does NOT consume the recommended daily servings of fruits and vegetables (5.5 servings)
  - **Food secure respondents consumed an average of 2.7 servings/day**
  - **Food insecure respondents consumed an average of 1.9 servings/day**

- In this sample a distaste for fruits and vegetables was *only* associated with a decrease in consumption among *food secure* respondents

Mook K, Laraia BA, Oddo VM, Jones-Smith JC. Food Security Status and Barriers to Fruit and Vegetable Consumption in Two Economically Deprived Communities of Oakland, California, 2013–2014. Prev Chronic Dis 2016;13:150402. DOI: http://dx.doi.org/10.5888/pcd13.150402

Children's National™

- The DASH diet – based on earlier Mediterranean diet research – lowers BP and cholesterol and reduces the risk of heart disease
- When the Mediterranean diet is paired with physical activity and weight loss the risk of T2DM decreases by 31%



Children's National

FiM Interventions Ask How We Can Support Our Patients in Adopting this Eating pattern

- FiM asks not only if people have consistent access to food, but if it is the RIGHT FOOD to both prevent and treat disease

- FiM pairs targeted food access directly with medical nutrition therapy – guided by evidence-based nutrition science - and supported by the health care system and clinical care team

We know we can't change people's diet's just by telling them. We have to find creative ways to work with our patients and communities

Americans LOVE to eat out: 44% of all food spending goes to eating food prepared outside of the home

- Age 35 – 54 ate highest number meals away from home

In a survey of chefs: 38% believe low consumer demand was the **greatest barrier** to including reduced-calorie items on the menu

- 71% rank taste as the most influential factor in the success of reduced-calorie items
- 93% believe that calories in menu items could be reduced by 10 – 25% without customers noticing.

https://www.ers.usda.gov/webdocs/publications/90228/eib-196.pdf?v=9515.3

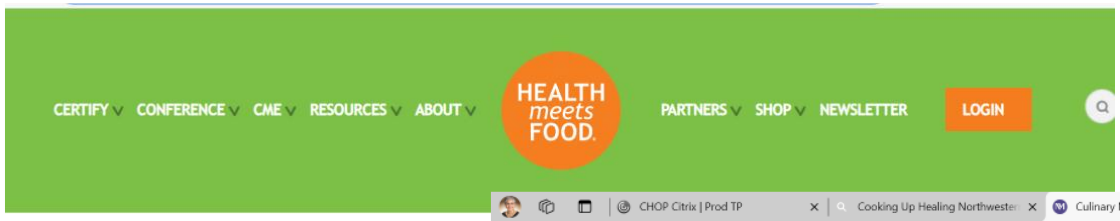
Pop Quiz: Which of the following has the most grams of sugar?

1. Tropical smoothie café acai bowl
2. Orange chicken from Panda Express
3. High protein pineapple mango smoothie from Smoothie King
4. Starbucks blueberry muffin

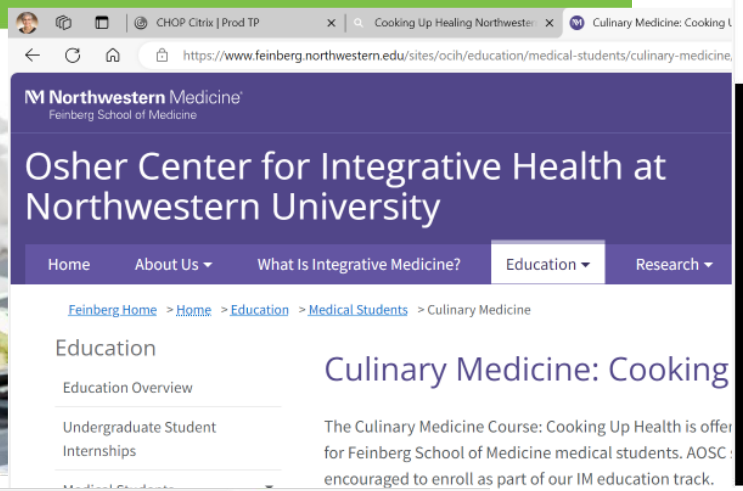
Pop Quiz: Which food has the most sodium?

1. Burger King Bacon Cheeseburger
2. Wendys Cobb Salad
3. Panda Express Orange Chicken
4. Panera Broccoli Cheddar Bread Bowl
5. Chick fil a Spicy Chicken Sandwich

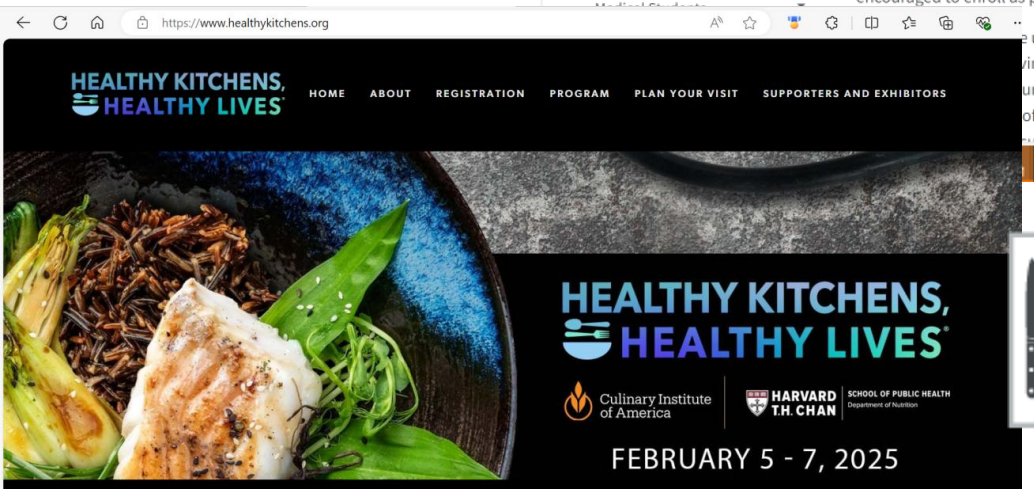
This is where nutrition education, culinary interventions, and teaching kitchens can come in

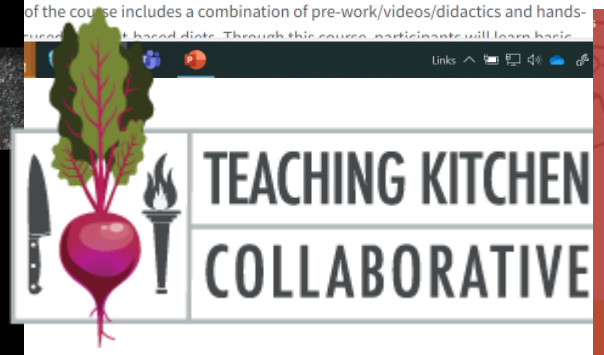














We want our health care professionals to not just talk, but walk alongside us

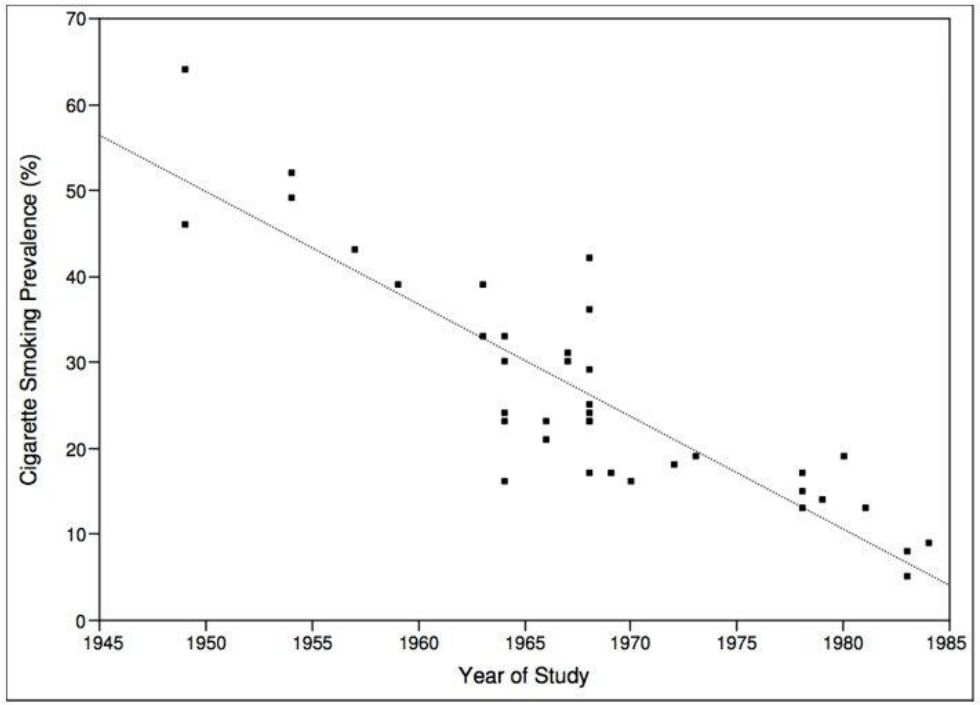


Figure 1
Decreasing Trend of Cigarette Smoking Prevalence among Physicians in the United States between 1949 and 1984.

Tobacco Induced Diseases 2008, 4:9doi:10.1186/1617-9625-4-9

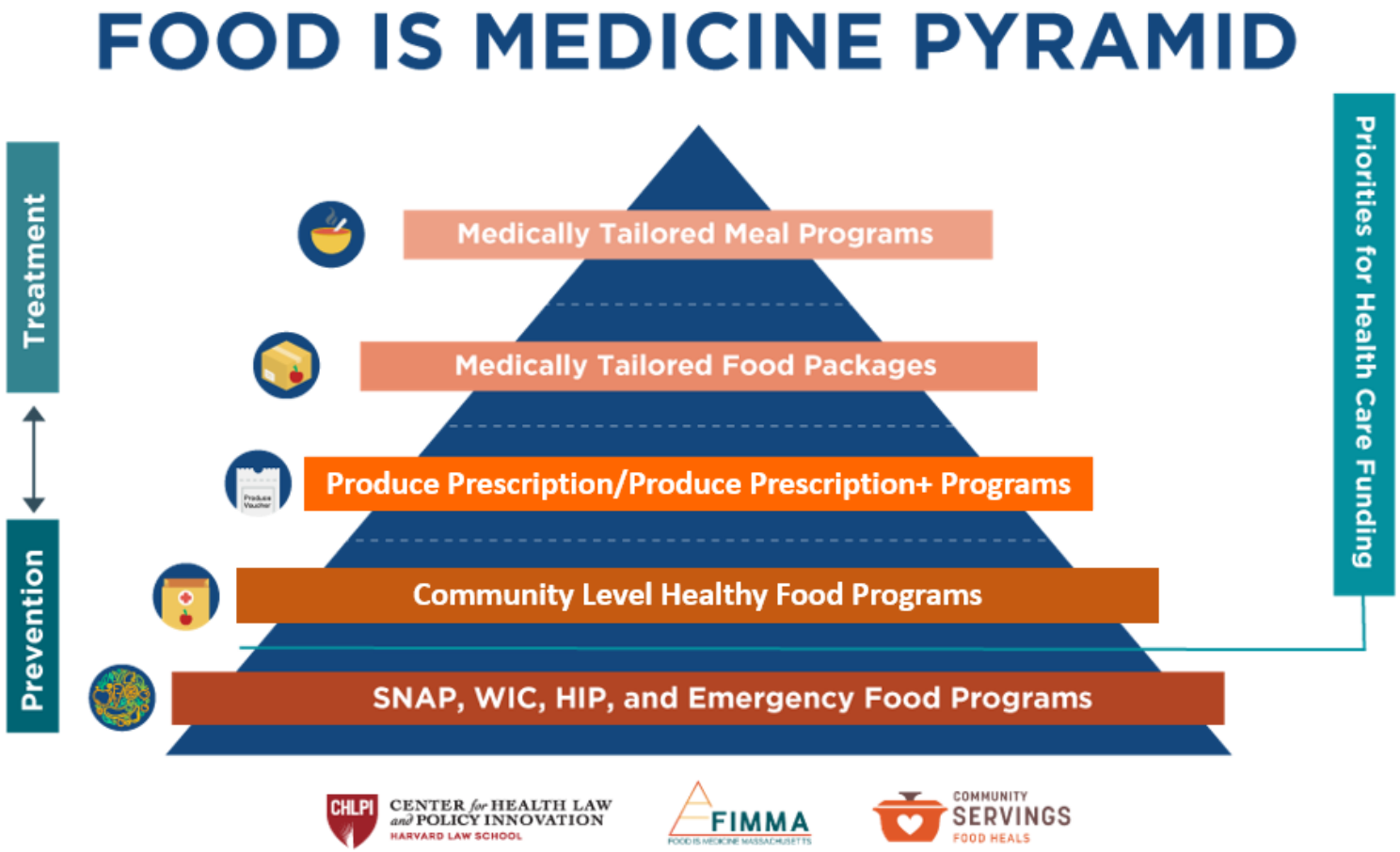
HHS has now made this a focus of their agenda: Secretary Kennedy encouraged schools to commit to a minimum of 40 hours of required nutrition education across all four years of undergraduate medical education or a minimum 40-hour competency equivalent beginning in Fall 2026

They have put out their own voluntary competency framework – with 71 competencies – to encourage medical schools to meet the 40 hour goal

Domain 1: Foundational Nutrition Knowledge 21 Competencies | 48.0 hours		
Competency #	**Competency Description**	**Hours**
1	Nutritional content of foods, macronutrients and micronutrients	3.0
2	Pathological states affecting nutrient absorption	3.0
3	Identifies nutrient deficiencies, recommends foods/supplements	3.0
4	Difference between food allergies and intolerance including gluten	1.5
5	Energy and nutrient requirements across lifespan	2.5
6	Drug-nutrient interactions	2.5
7	Nutritional differences: minimally processed vs highly processed foods	2.0
8	Interprets nutrition labels and menu labeling	2.0
9	Clinically assisted nutrition (enteral/parenteral) – recommended at the GME level for appropriate specialties only	3.0
10	Functions of essential nutrients	2.5
11	Principles of healthy balanced diet per national guidelines	2.0
12	Evidence-based guidance on healthy beverage consumption	1.5
13	Mitochondrial metabolism and energy regulation: understand nutrient-driven ATP synthesis and how overnutrition leads to insulin resistance	4.0
14	Structural components from food: recognize how dietary amino acids, essential fatty acids, and cholesterol build proteins, membranes, and hormones	2.5
15	Micronutrient cofactors in enzymatic function: master how vitamins and minerals drive reactions and how deficiencies undermine function	4.0
16	Hormonal regulation through food composition: understand how meal composition	3.0

Children's National

Back to our interventions: where are we intervening here at Children's National?



Healthy Food Workgroup Strategies

HEALTHY FOOD

GOAL:
Increase Access to Healthy Food Options



	OUR STRATEGIES	ANTICIPATED OUTCOMES
ADVOCACY	**Advocate for funding for and improved access to** healthy food options in the community	• Increase government and philanthropic funding for healthy food options
PROGRAMS & PRACTICE	**Increase access to healthy food options** within the hospital and community through the hospital cafeteria, food pharmacies, farmers markets and other initiatives **Expand food insecurity screenings** to determine eligibility for enrollment in food access programs	• Improve food security screenings for families • Increase access to healthy food options

CURRENT PROGRAMS AND EFFORTS

Food Pharmacy Program, in partnership with the Capital Area Food Bank. Children diagnosed with prediabetes or diabetes who also screen positive for food insecurity are provided with medically tailored groceries.

FLiP and FLiPRx offers community cooking classes and a produce prescription program.

HSC's Healthy Habits program is an eight-week class that focuses on healthy lifestyle, behavior health and nutrition education.

Children's National™

Expanding Food and Health Partnerships

CAFB

- Since 1980, the Capital Area Food Bank has existed to help solve the problem of hunger across the Greater Washington region
- The mission of the Capital Area Food Bank is to help our neighbors thrive by creating more equitable access to food and opportunity through community partnerships

Food+ Health Pilots

- Food+ Health pilots aim to implement nutrition interventions within healthcare environments
- CAFB combines food distribution with various partner-provided healthcare services to maximize impact and increase positive health outcomes

Children's National™

Children's Food Pharmacy in the Diabetes Care Complex – in Partnership with CAFB

- The Food Pharmacy provides a predetermined menu of **medically tailored groceries** for families experiencing food insecurity.
- Led by the dietitians in the diabetes clinic
- Available at every clinic visit (~3 months or sooner if needed)
- Currently available for endocrine, special immunology, and hypertension patients



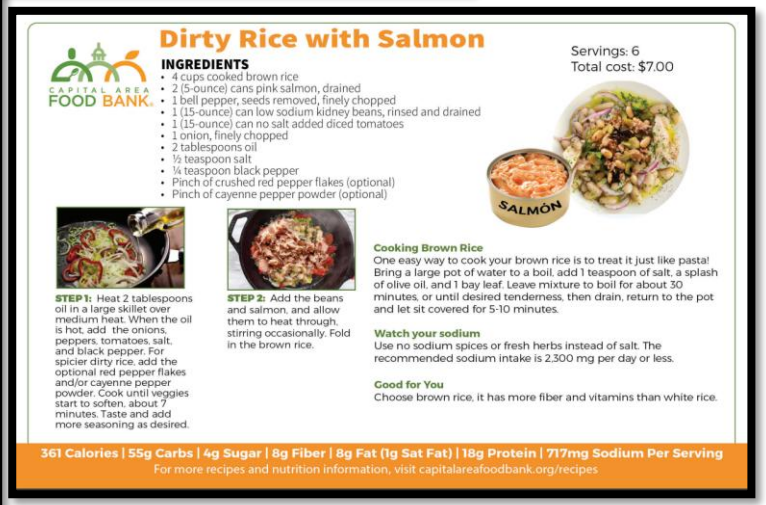
Children's National

Other supplies provided

- Reusable grocery bags
- Recipes cards
- Nutrition education handouts
- Food pantry information
- Grocery carts







Dirty Rice with Salmon

CAPITAL AREA FOOD BANK

Servings: 6
Total cost: $7.00

INGREDIENTS

- 4 cups cooked brown rice
- 2 (5-ounce) cans pink salmon, drained
- 1 bell pepper, seeds removed, finely chopped
- 1 (15-ounce) can low sodium kidney beans, rinsed and drained
- 1 (15-ounce) can no salt added diced tomatoes
- 1 onion, finely chopped
- 2 tablespoons oil
- ½ teaspoon salt
- ¼ teaspoon black pepper
- Pinch of crushed red pepper flakes (optional)
- Pinch of cayenne pepper powder (optional)

STEP 1: Heat 2 tablespoons oil in a large skillet over medium heat. When the oil is hot, add the onions, peppers, tomatoes, salt, and black pepper. For spicier dirty rice, add the optional red pepper flakes and/or cayenne pepper powder. Cook until veggies start to soften, about 7 minutes. Taste and add more seasoning as desired.

STEP 2: Add the beans and salmon, and allow them to heat through, stirring occasionally. Fold in the brown rice.

Cooking Brown Rice
One easy way to cook your brown rice is to treat it just like pasta! Bring a large pot of water to a boil, add 1 teaspoon of salt, a splash of olive oil, and 1 bay leaf. Leave mixture to boil for about 30 minutes, or until desired tenderness, then drain, return to the pot and let sit covered for 5-10 minutes.

Watch your sodium
Use no sodium spices or fresh herbs instead of salt. The recommended sodium intake is 2,300 mg per day or less.

Good for You
Choose brown rice, it has more fiber and vitamins than white rice.

361 Calories | 55g Carbs | 4g Sugar | 8g Fiber | 8g Fat (1g Sat Fat) | 18g Protein | 717mg Sodium Per Serving

For more recipes and nutrition information, visit capitalareafoodbank.org/recipes

Children's National ™

Food Pharmacy at Columbia Heights

- The CHC – Columbia Heights office started operating it's food pharmacy August 8th 2024
- Using paper FI screeners they find their patient population has a food insecurity rate ~ 40%
- Many staff members have volunteered their own time to unpack shelf stable food deliveries and package them for distribution



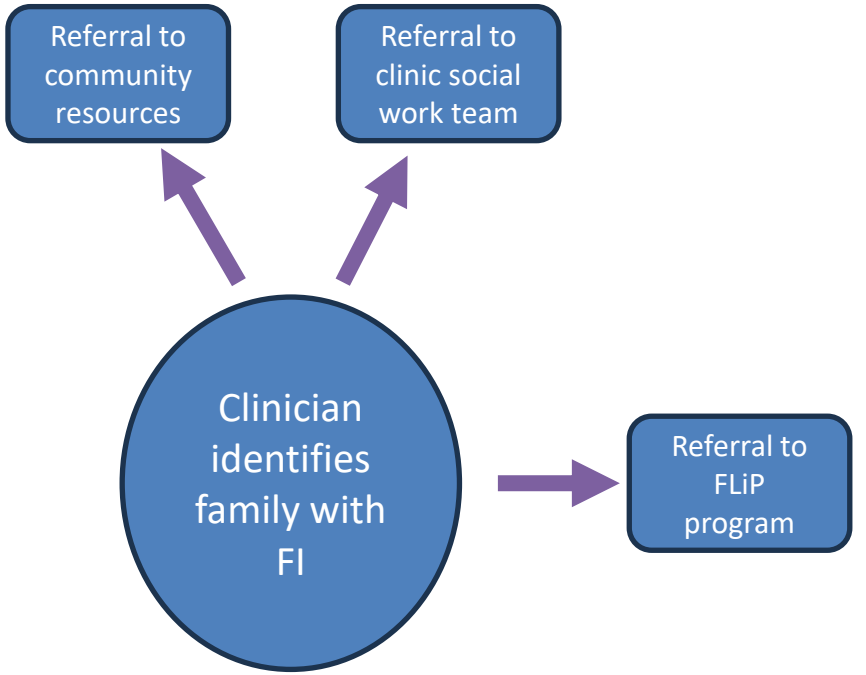
Children's National

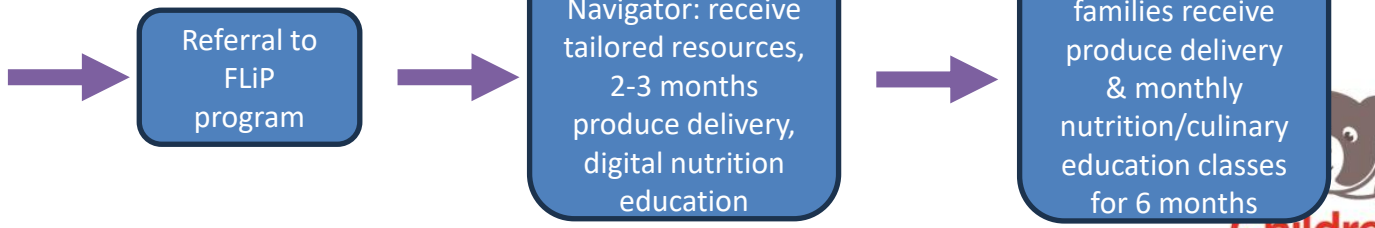
FLiP – Family Lifestyle Program – and FLiPRx



The Family Lifestyle Program started as a student patient navigator pilot in 2019 utilizing medical students as patient navigators to connect families to community-based resources for food access, nutrition education and physical activity

In 2021 the FLiP **produce prescription** pilot started in partnership with the YMCA and AHA, now including a partnership with 4P foods it has expanded access to eligible families across the CN Goldberg Centers





Children's National

FLiP Produce Prescription Intervention

FLiP FAMILY LIFESTYLE PROGRAM

Pediatric clinicians universally screen families for FI

↓

Positive screen = Patient navigators referral

(access federal and local food resources, including our Produce Rx)

→



Produce RX

- 8 lbs of locally-sourced produce delivered to the home every other week
- Onboarding kit (spices, tools, staples ingredients)

+

Experiential learning opportunities (virtual, video, live, print, web)



Children's National

In Their Own Words: Participant Experiences…

Diet Quality:

Availability of produce influenced healthy eating

"It definitely introduced some things that I wouldn't have purchased and eaten and then it gave me ideas of how to make different dishes more healthier."

"Now [my daughter], wants fruits and vegetables every day for dinner and she eat more fruits throughout the day instead of her regular snacks she'd been eating. When we're going to the grocery stores, she go straight to the produce and get our vegetables."

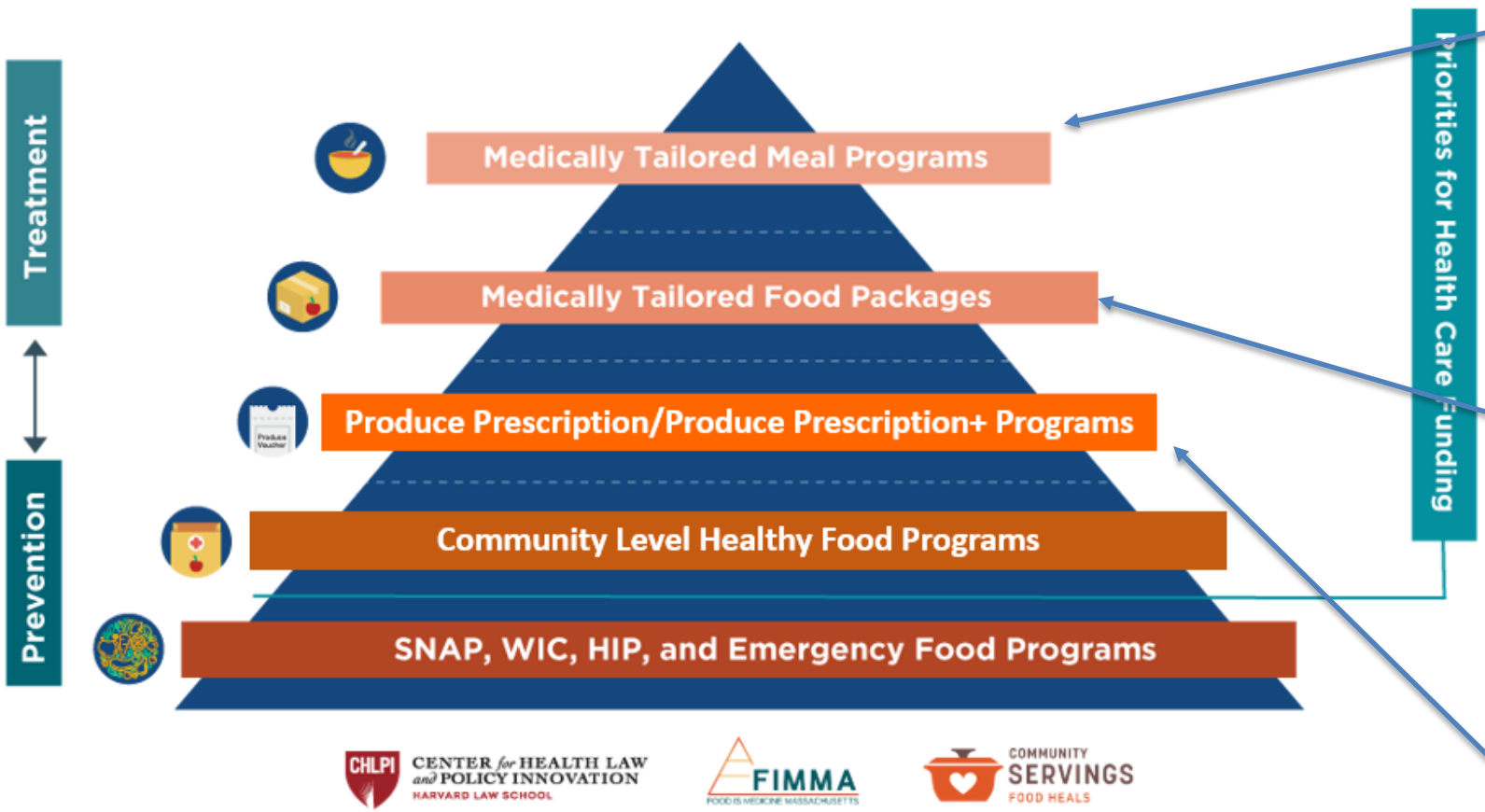
FLiP FAMILY LIFESTYLE PROGRAM

Children's National

What other ways can we expand advocacy, research, and funding for FiM interventions?



FOOD IS MEDICINE PYRAMID



Historically, medically tailored meals have been provided to populations with highly complex health profiles. Programs have emphasized **immediate** treatment of urgent health needs, with little minimal emphasis on prevention and only one study in a pediatric population

Medically tailored groceries—sometimes called **healthy food boxes, healthy food packages, food pharmacies, or hospital/clinical food pantries**—blend components from MTMs and produce prescriptions

CHLPI CENTER for HEALTH LAW and POLICY INNOVATION HARVARD LAW SCHOOL

FIMMA FOOD IS MEDICINE MASSACHUSETTS

COMMUNITY SERVINGS FOOD HEALS

The definition of "produce" can also vary by program: most programs support access only to fruits and vegetables, while others have included legumes, grains, and more, blurring the distinction between produce prescriptions and medically tailored groceries. Produce prescriptions are sometimes paired with services provided by RDNs, such as nutrition education, nutrition resources, supermarket tours, cooking classes, and medical nutrition therapy.

Children's National

Policy and Legislative Advocacy Opportunities

- **Lobby for Medicaid/Medicare expansion:** Advocate to state and federal lawmakers for Section 1115 waivers and Medicare Advantage expansions that allow public insurance funds to cover nutritional interventions

- **Support the Farm Bill:** Engage with federal lawmakers during Farm Bill reauthorizations to protect and expand funding for nutrition programs like SNAP, WIC, and the Gus Schumacher Nutrition Incentive Program (GusNIP)

- **Provide expert testimony:** Volunteer to testify before state legislatures or local government committees regarding the clinical and cost-saving benefits of FIM initiatives.

Children's National™

Medically Tailored Meals (MTM)

6 months of meals reduced hospitalizations, ED visits, and costs in Massachusetts Medicaid[1]

Tufts University | Gerald J. and Dorothy R. Friedman School of Nutrition Science and Policy
FOOD IS MEDICINE INSTITUTE

UMass Chan Medical School

Community Servings Food Heals | AMPL Institute

Key Findings

31% fewer hospitalizations

20% fewer emergency department visits

$3,433 lower healthcare costs per patient

98% of meal program costs offset

*Per-patient healthcare cost **reductions** in higher-risk subgroups**

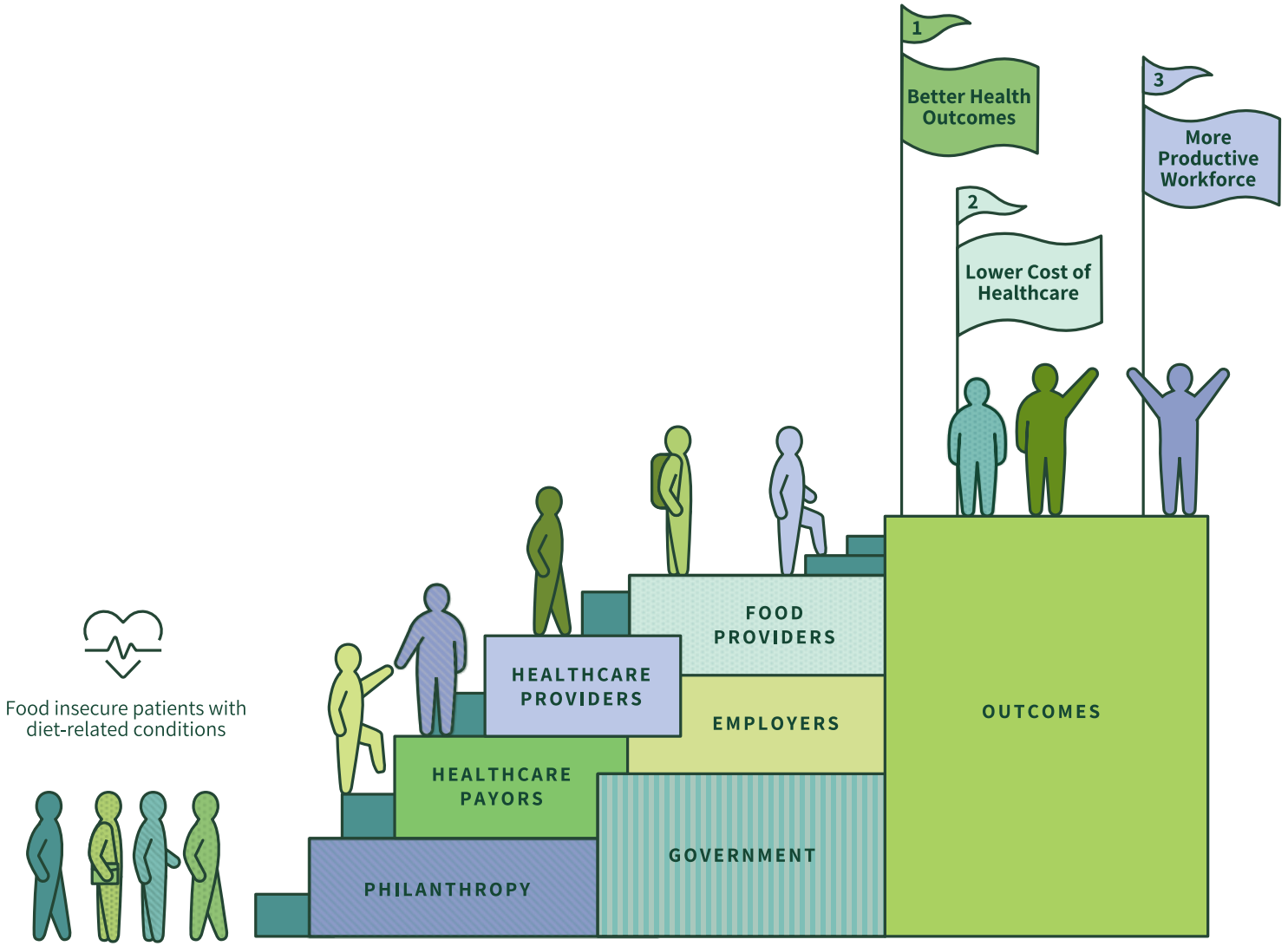
$12,312 chronic kidney disease

$10,450 cardiovascular disease

$5,597 depression

$4,123 diabetes

Children's National



https://hunger-report.capitalareafoodbank.org/report-2025/#food-insecurity-trends-in-greater-washington

"Food is our common ground, a universal experience."
James Beard







Please visit the Seva Teaching Kitchen at 1810 K Street NW

Email me with any questions! ALTucker@childrensnational.org or ALTucker@gwu.edu

Continuing Education – Learner Notification

Two Decades of Progress: Advancing Pediatric Obesity Care

September 18th, 2026

Notice of Requirement for Successful Completion

Participants may earn CE credit for this activity by attending the entire education session and completing the required evaluation. Instructions for claiming CE credit, including the attendance code, will be provided at the conclusion of the activity.

Nurses: Children's National Hospital designates this live activity for a maximum of 5.0 ANCC contact hours for nurses. Nurses should claim only the credit commensurate with the extent of their participation in the activity.

Physicians: Children's National Hospital designates this live activity for a maximum of 5.0 AMA PRA Category 1 Credits*TM* for physicians. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Pharmacists: Children's National Hospital is accredited by the Accreditation Council for Pharmacy Education (ACPE) as a provider of continuing pharmacy education. This program meets ACPE criteria for 5.0 contact hours.

Psychologists: Continuing Education (CE) credits for psychologists are provided through the co-sponsorship of the American Psychological Association (APA) Office of Continuing Education in Psychology (CEP). The APA CEP Office maintains responsibility for the content of the programs. Children's National Hospital designates this live activity for a maximum of 5.0 CE credits (Instructional Level: Intermediate Learning).

IPCE: This activity was planned by and for the healthcare team, and learners will receive 5.0 Interprofessional Continuing Education (IPCE) credit for learning and change.

Relevant Financial Relationships

The planning committee and presenters have no relevant financial relationships with ineligible companies.

Financial and In-Kind Commercial Support

No financial nor in-kind commercial support was received for this education activity.

In support of improving patient care, Children's National Hospital is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team. Children's National Hospital Accreditation Provider# 4008362.

Advancing Pediatric Obesity Care

BEYOND THE SCRIPT: PEDIATRIC NUTRITION IN THE GLP-1 ERA



Rachel DiGiacomo, RDN, LD

ABOUT ME

Graduate of Penn State University and UMD College Park

Former IDEAL Clinic Dietitian

Founder of Good Sense Nutrition LLC

www.goodsensenutrition.com





PRESENTATION OBJECTIVES

CURRENT LANDSCAPE 4

ROLE OF NUTRITION COUNSELING IN MDT 7

EVIDENCE-BASED DIETARY INTERVENTIONS 9

RECOGNIZING DISORDERED EATING 13

COUNSELING STRATEGIES 14



CURRENT LANDSCAPE



Integrated care is essential.



Diet alone is not enough.



Social media is a new “macronutrient.”[1] [2]

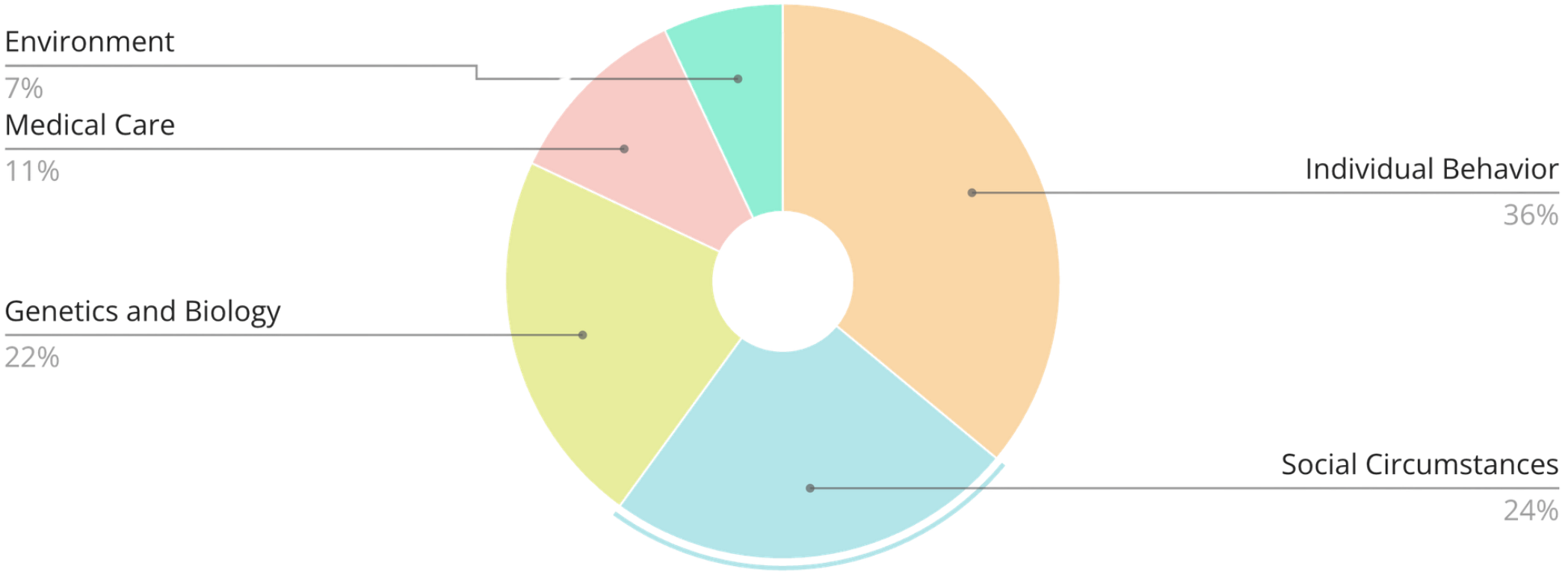


Added psychological complexity to interventions.[2] [3]

[1] Robinson TN, et al. Pediatrics. 2017;140(suppl 2):S97-S101. [2] Fatima S, et al. Cureus. 2024;16(4):e58392. [3] Rad F, et al. Cureus. 2024;16(4):e58712.

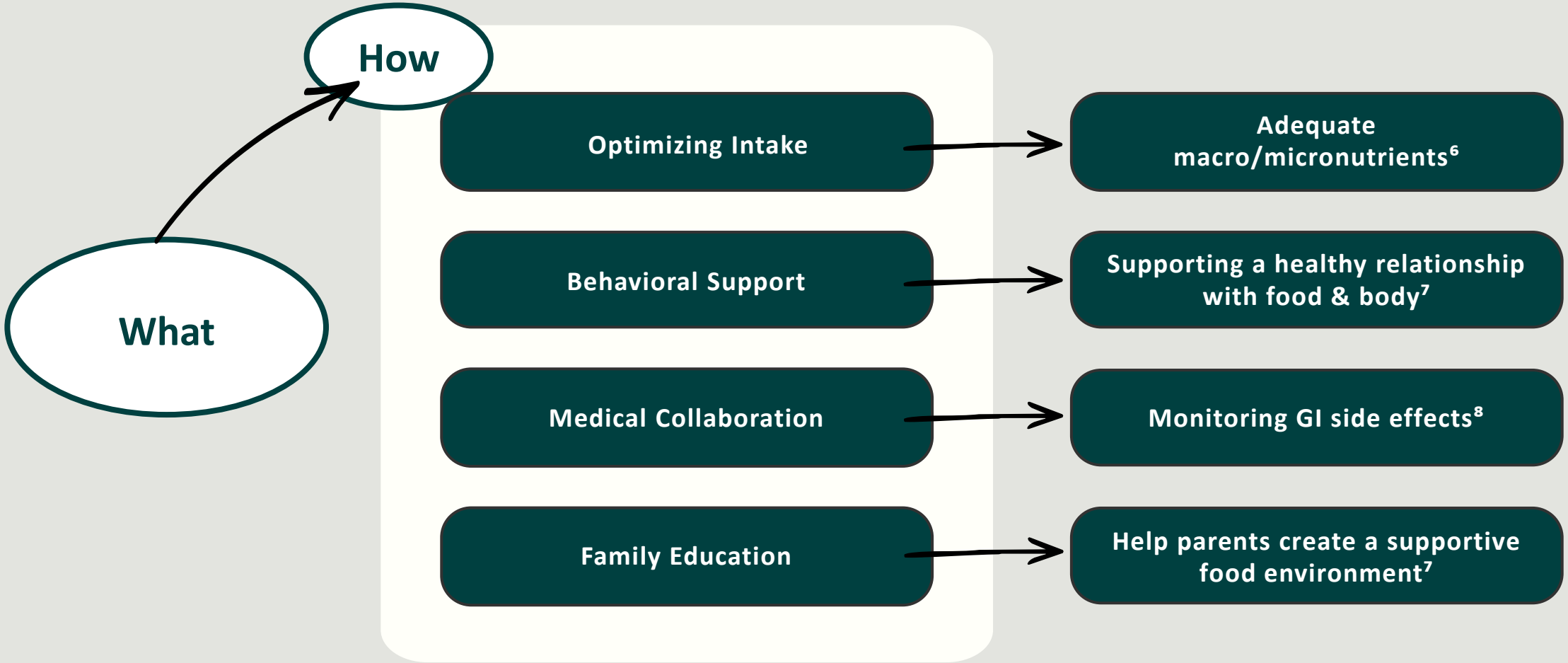
THE SOCIAL DETERMINANTS OF HEALTH

A family's socioeconomic status, time, and access to nutrient-dense foods determine if lifestyle changes are actually feasible.[5]



[4] Speakman JR, et al. Nat Metab. 2023;5(4):579-588. [5] Shaffer LA, et al. Pediatrics. 2026;157(4):e2025074094.

NUTRITION COUNSELING IN MDT



[6] Standard J, et al. Nutrients. 2023;15(24):5097. [7] Barlow SE, et al. Nutr Clin Pract. 2010;25(4):333-340. [8] Fitch A, et al. Obes Med. 2024;46:100524.



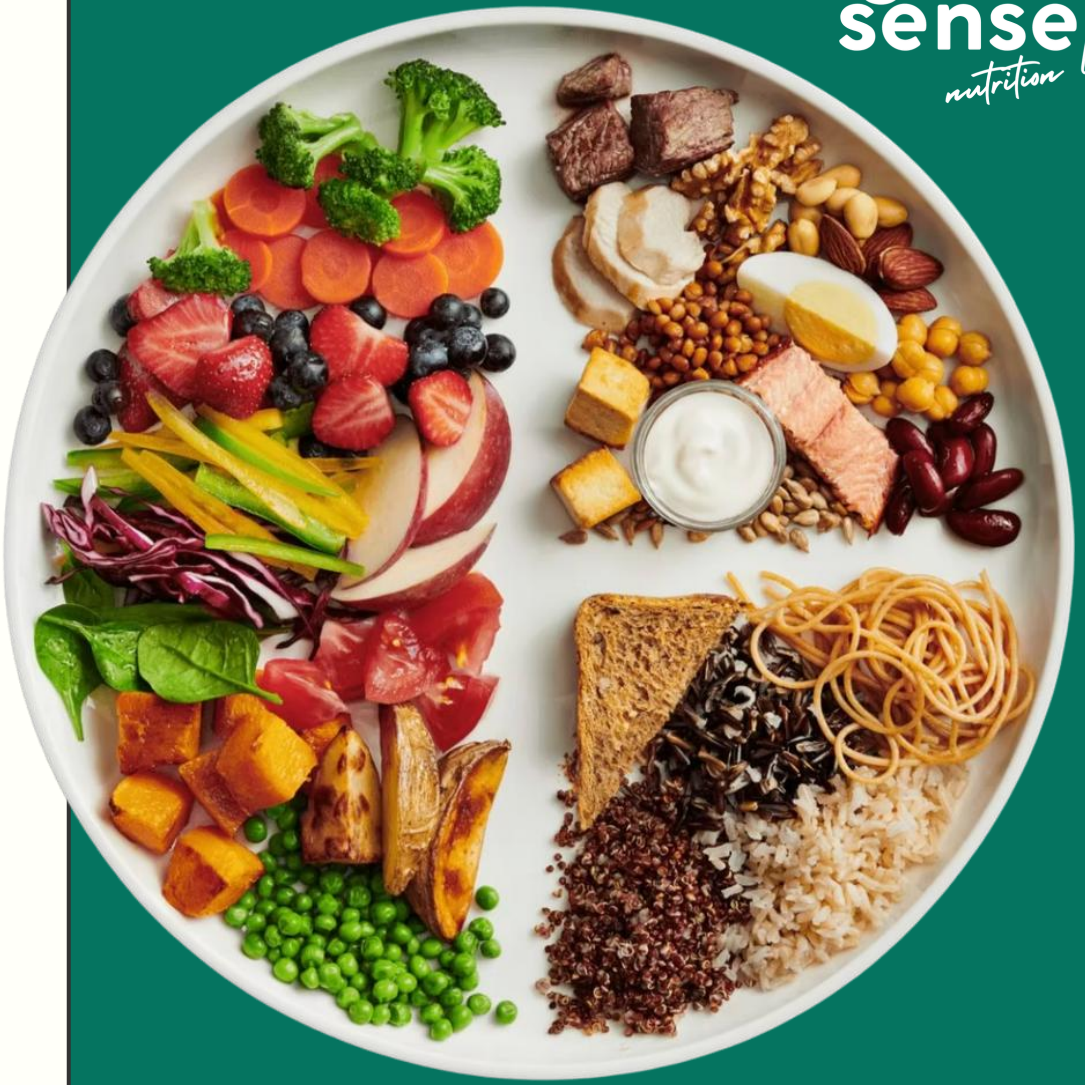
EVIDENCE-BASED DIETARY INTERVENTIONS

- Prioritize protein intake[10]
- Nutrient-dense, smaller portions[9]
- Strategic fiber consumption[8]
- Proactive hydration monitoring[9]
- Targeting obesogenic behaviors

[8] Fitch A, et al. Obes Med. 2024;46:100524. [9] Kelly AS, et al. Pediatrics. 2025;155(4):e2024068119. [10] Zhang X, et al. World J Pediatr. 2026;22(2):145-154.

PRIORITIZE PROTEIN

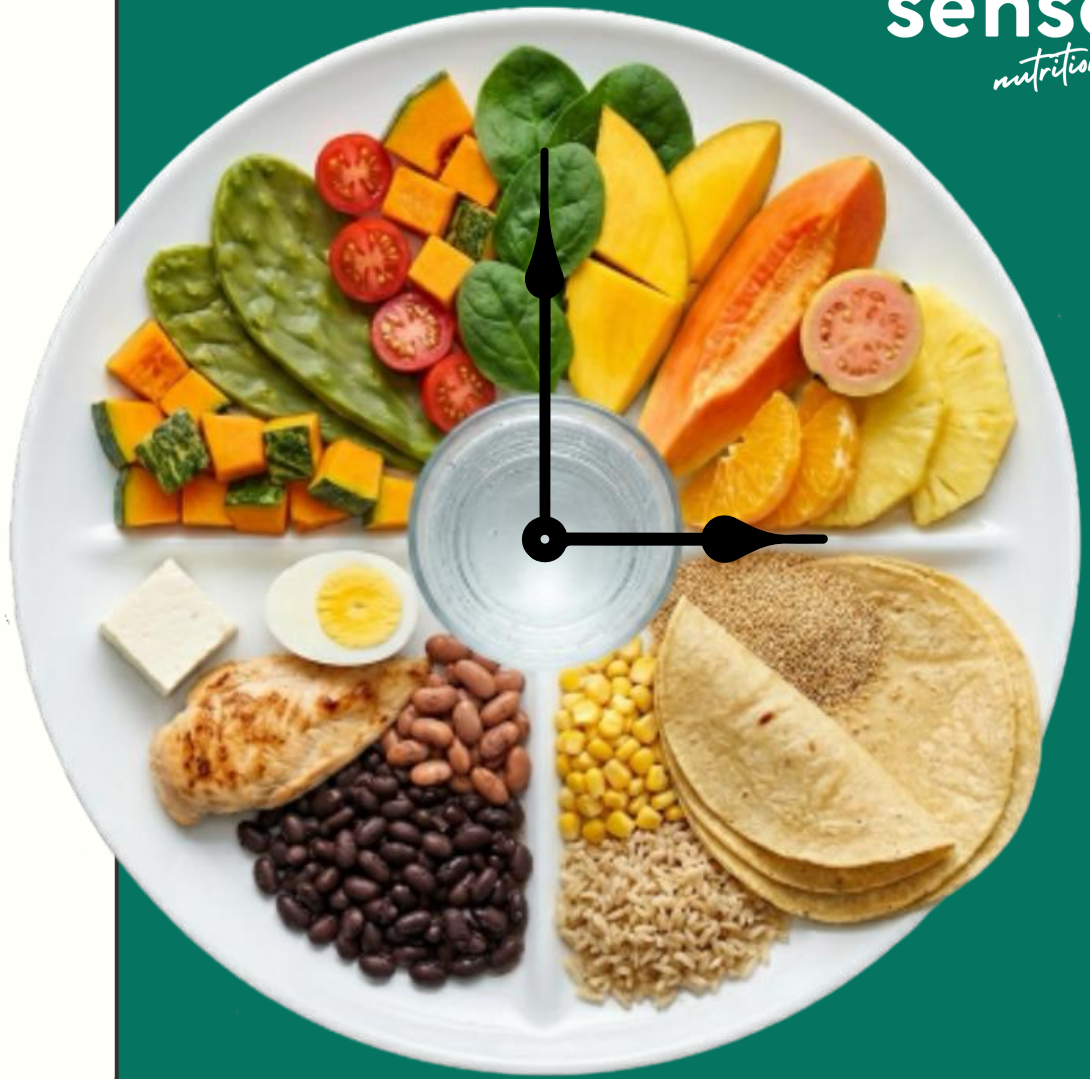
- Encourage patients to prioritize protein.[12]
- Aim for high-quality, lean protein sources.[13]
- Spread protein intake throughout the day.[12]
- Pair protein with physical activity.[11]



[11] Miller E, et al. Children. 2025;12(11):1427. [12] Sullivan J, et al. J Pediatr Clin Nutr. 2025;9(2):112-121. [13] Mozaffarian D, et al. Am J Clin Nutr. 2025;121(5):1224-1238.

MEAL TIMING

- Shift to smaller, more frequent meals.[12]
- Encourage “three checkpoints per day.”[12]
- Reinforce eating slowly.[13]
- Avoid skipping meals entirely.[13]



[12] Sullivan J, et al. J Pediatr Clin Nutr. 2025;9(2):112-121. [13] Mozaffarian D, et al. Am J Clin Nutr. 2025;121(5):1224-1238.

FIBER & HYDRATION

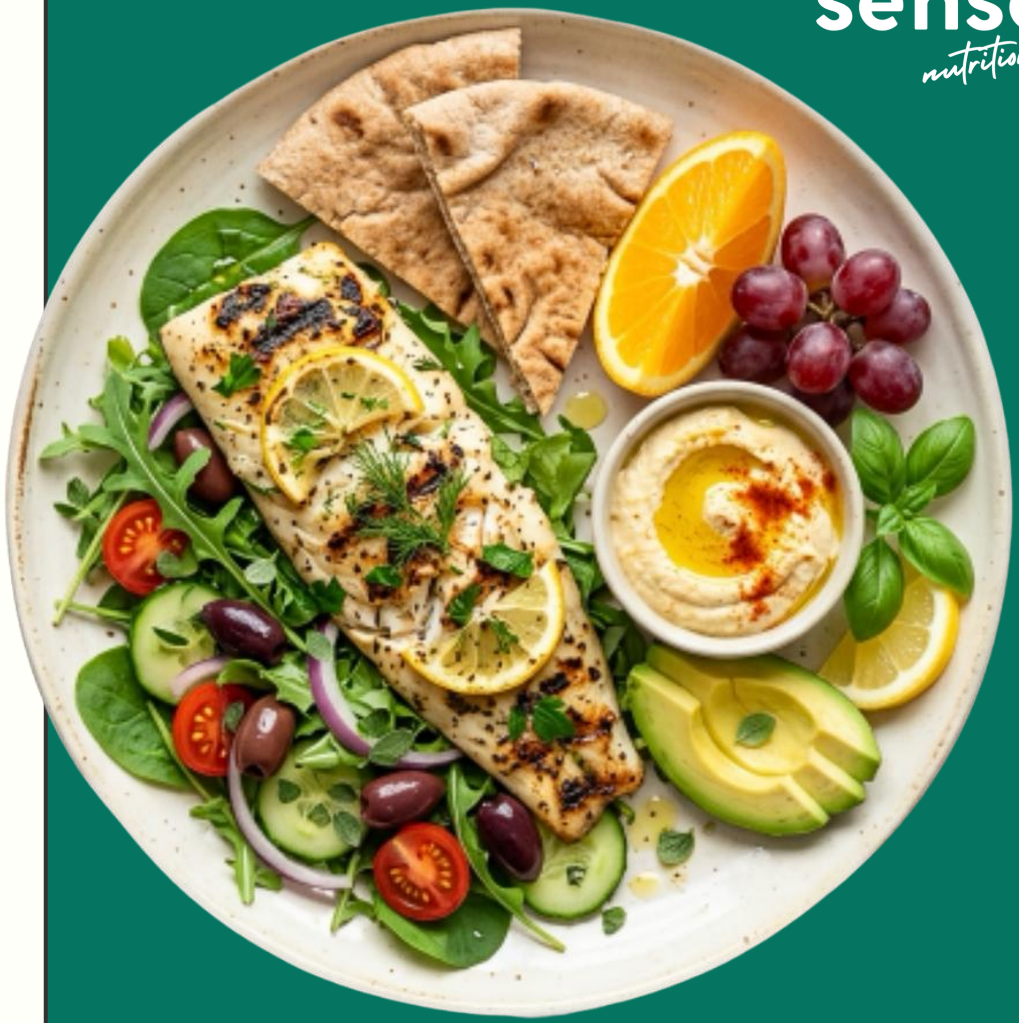
- Adequate fiber mitigates GI side effects.[8]
- Introduce fiber gradually.[8]
- Increase fiber with fluid.[13]
- Consume water throughout the day.[13]



[8] Fitch A, et al. Obes Med. 2024;46:100524. [12] Sullivan J, et al. J Pediatr Clin Nutr. 2025;9(2):112-121. [13] Mozaffarian D, et al. Am J Clin Nutr. 2025;121(5):1224-1238.

ADD, NOT SUBTRACT

- Restriction ignores the root drivers of obesity.[7]
- Teach patients what to add, not take away.[6]
- Avoid a “clean” pantry.[7]
- Check your personal food bias at the door.[7]



[6] Standard J, et al. Nutrients. 2023;15(24):5097. [7] Barlow SE, et al. Nutr Clin Pract. 2010;25(4):333-340.



RECOGNIZING DISORDERED EATING

- Ingredient and/or calorie hyper-fixation[13] [14]
- Secretive eating[13] [14]
- Scale and body image anxiety[13] [14]
- Compulsive body checking[13] [14]

[13] Mozaffarian D, et al. Am J Clin Nutr. 2025;121(5):1224-1238. [14] Antunes R, et al. Nutrients. 2024;16(5):713.Rad F, et al. Cureus. 2024;16(4):e58712. [15] Obesity Action Coalition. Accessed September 10, 2026. [16] Fitch A, et al. J Acad Nutr Diet. 2025;125(3):412-421.

FAMILY-CENTERED COUNSELING STRATEGIES



COUNSELING STRATEGIES



Reinforce that “all foods fit” into a healthy diet.[7]



Focus on what foods to ADD rather than take away.[7]



Teach parents the Division of Responsibility.[14]



Remove morality from foods and shift to functional phrasing.[7]

[7] Barlow SE, et al. Nutr Clin Pract. 2010;25(4):333-340. [14] Antunes R, et al. Nutrients. 2024;16(5):713.

DIGITAL HYGIENE

- Encourage device-free meals and snacks.[15]
- Challenge patients to curate their feed.[3]
- Online content is not realistic.[3]



[3] Rad F, et al. Cureus. 2024;16(4):e58712. [15] Obesity Action Coalition. Accessed September 10, 2026.

CLINICAL ADAPTATIONS

- Be mindful of your own food biases.[16]
- Take notice of anxiety around weight and adapt care.[11]
- Focus on non-scale victories.[11]
- Tying health to physical capability helps create long-term healthy habits.[11]

[11] Miller E, et al. Children. 2025;12(11):1427. [16] Fitch A, et al. J Acad Nutr Diet. 2025;125(3):412-421.

REFERENCES

1. **Robinson TN, Banda JA, Hale L, et al.** Screen media exposure and obesity in children and adolescents. Pediatrics. 2017;140(suppl 2):S97-S101. doi:10.1542/peds.2016-1758K
2. **Fatima S, Shariff RE, Khwaja HA, et al.** The impact of social media & technology on child and adolescent mental health. Cureus. 2024;16(4):e58392. doi:10.7759/cureus.58392
3. **Rad F, Khan MA, Shama S, et al.** Social media effects regarding eating disorders and body image in young adolescents. Cureus. 2024;16(4):e58712. doi:10.7759/cureus.58712
4. **Speakman JR, de Jong JMA, Sinha S, et al.** Total daily energy expenditure has declined over the last 3 decades due to declining basal expenditure not reduced activity expenditure. Nat Metab. 2023;5(4):579-588. doi:10.1038/s42255-023-00782-2
5. **Shaffer LA, Thompson M, Hernandez R, et al.** Characteristics of youth treated with GLP-1RAs at an integrated weight management clinic. Pediatrics. 2026;157(4):e2025074094. doi:10.1542/peds.2025-074094
6. **Standard J, O'Connor J, Martinez-Steele E, et al.** Nutrition interventions for pediatric obesity prevention: an umbrella review of systematic reviews. Nutrients. 2023;15(24):5097. doi:10.3390/nu15245097
7. **Barlow SE, Boutwell AE.** Multidisciplinary treatment of pediatric obesity: nutrition evaluation and management. Nutr Clin Pract. 2010;25(4):333-340. doi:10.1177/0884533610373771
8. **Fitch A, Gigliotti L, Bays HE.** Application of nutrition interventions with GLP-1 based therapies: a narrative review of the challenges and solutions. Obes Med. 2024;46:100524. doi:10.1016/j.obmed.2024.100524

REFERENCES

1. **Kelly AS, Arslanian SA, Haqq AM, et al.** GLP-1 receptor agonists in pediatric and adolescent obesity. Pediatrics. 2025;155(4):e2024068119. doi:10.1542/peds.2024-068119
2. **Zhang X, Zhao Y, Wang L.** Beyond lifestyle modification: the role of GLP-1 receptor agonists in treating pediatric obesity. World J Pediatr. 2026;22(2):145-154. doi:10.1007/s12519-025-00892-y
3. **Miller E, Cooper S, Davis R.** Beyond weight loss: optimizing GLP-1 receptor agonist use in children. Children. 2025;12(11):1427. doi:10.3390/children12111427
4. **Sullivan J, O'Donnell M, Peterson K.** Dietary recommendations for pediatric and adolescent patients utilizing GLP-1 receptor agonists for weight management: a narrative review of current literature. J Pediatr Clin Nutr. 2025;9(2):112-121. doi:10.1016/j.jpcn.2025.100234
5. **Mozaffarian D, Agarwal M, Aggarwal M, et al.** Nutritional priorities to support GLP-1 therapy for obesity: a joint advisory from the American College of Lifestyle Medicine, the American Society for Nutrition, the Obesity Medicine Association, and the Obesity Society. Am J Clin Nutr. 2025;121(5):1224-1238. doi:10.1016/j.ajcn.2025.02.040
6. **Antunes R, Rodrigues J, Fonseca H.** Parenting style and social media: impact on children’s dietary patterns. Nutrients. 2024;16(5):713. doi:10.3390/nu16050713
7. **Obesity Action Coalition.** Scrolling for self-worth. Obesity Action Coalition website. Accessed September 10, 2026. obesityaction.org
8. **Fitch A, Gigliotti L, Bays HE.** Incretin-based therapies and lifestyle interventions: the evolving role of registered dietitian nutritionists in obesity care. J Acad Nutr Diet. 2025;125(3):412-421. doi:10.1016/j.jand.2024.09.025

CONNECT WITH ME

Phone: 610 235 2782

Email: rachel@goodsensenutrition.com



How to Claim CE Credit

1. Submit the **attendance code VASYEH** by:
   - Texting to **301-273-7643,** or
   - Entering **online** at ce.childrensnational.org/code
2. Complete the Evaluation
3. Download CE Certificate

Credit may be claimed up to 60 days from the date of the live event.