# GLP-1: What You Need to Know

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# Rapper Big Pun Dies of Heart Attack at age 28



# Is Obesity Really the Problem?

Fat Distribution Analysis



#### 42%

75%

### Adult Obesity Rate

Nearly half of American adults now classify as obese.

### Overweight or Obese

Three-quarters of adults exceed healthy weight guidelines.

9%

### Severe Obesity

Adults with BMI over 40 face dramatically increased health risks.

Obesity rates have tripled since 1975. Southern states show highest prevalence. Socioeconomic factors strongly predict obesity patterns across communities.

### Map: Overall Obesity

Prevalence<sup>†</sup> of Self-Reported Obesity Among U.S. Adults by State and Territory, **BRFSS**, 2018

<sup>†</sup>Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.



Source: Behavioral Risk Factor Surveillance System \*Sample size <50 or the relative standard error (dividing the standard error by the prevalence)  $\geq 30\%$ 

# **Obesity Across the Lifespan: Pregnancy**



# 1.7x Higher Risk

Women with obesity face 1.7 times greater odds of cardiac events during pregnancy.



# 23% Cardiac Events

Obesity increases cardiac complications compared to 14% in normal-weight pregnancies.



4x Pre-eclampsia Risk

Pre-eclampsia rates quadruple in obese pregnancies (8% vs 2%).

CARPREG II scores show compounding risks when obesity is present during pregnancy.



# **Obesity Across the Lifespan: Maternal Diet**



Fried foods and sugar-sweetened beverages during pregnancy alter fetal development.

Rapid Growth

Children experience accelerated weight gain in early developmental stages.

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Obesity Risk

choices.

Maternal nutrition creates metabolic programming that persists throughout the child's life. This represents a critical intervention point for breaking the intergenerational obesity cycle.

Reference: Godfrey KM, et al. Maternal diet during pregnancy and offspring health outcomes. Nature Reviews Endocrinology. 2018;14(1):12-34.





### Offspring face significantly higher lifetime obesity risk from maternal



# 374%

### Higher Mortality Risk

Adolescent obesity dramatically increases adult cardiovascular death risk.

### **Research Impact**

NEJM study showed alarming correlation between teen weight and heart outcomes.

One in five American adolescents currently lives with obesity.

Adolescent weight patterns establish lifelong metabolic trajectories. The cardiovascular impact extends decades beyond teenage years.

Early intervention during this critical developmental window can prevent irreversible cardiovascular damage.

Reference: Twig G, et al. Body-Mass Index in 2.3 Million Adolescents and Cardiovascular Death in Adulthood. New England Journal of Medicine. 2016;374(25):2430-2440.

# 20%

### Teen Prevalence



### **Earlier Mortality**

Adults with obesity die sooner from cardiovascular disease.



## Sicker Lives

Quality of life significantly diminishes with obesity-related heart conditions.



**CV Burden** 

Obesity's cardiovascular impact extends through adulthood, compounding earlier life risks. The burden grows heavier with time.

#### Heart failure, stroke, and coronary disease risks multiply with obesity.



### Adipose Biomarkers

Excess fat tissue releases inflammatory mediators throughout the body.



### Systemic Inflammation

Inflammatory signals disrupt normal metabolic function and vascular health.



## Cardiovascular Damage

disease.

Adipose tissue acts as an endocrine organ, not just inert fat storage. Its bioactive compounds affect insulin sensitivity, blood pressure, and clotting factors.

#### Endothelial dysfunction develops, accelerating atherosclerosis and heart



### **Peri-coronary Fat**

Adipose tissue directly surrounds coronary arteries, creating localized inflammation.



## Vascular Response

Inflammatory signals trigger dangerous chemokine cascades within blood vessel walls.



## Plaque Destabilization

These pathways accelerate plaque rupture.

Peri-coronary fat acts as more than passive storage. It becomes metabolically active in obesity.

# atherosclerosis and increase risk of

# Disparities in Obesity



### **Black** Communities

Black communities face significantly higher obesity rates compared to other populations, creating substantial health disparities.



### **Hispanic Populations**

Hispanic populations experience disproportionate impact from obesity, influenced by various socioeconomic and environmental factors.



# Nature vs Nurture



# Social Determinants of Health

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Limited Access

Food deserts restrict healthy options.

**Education Gaps** 

Nutritional knowledge disparities.

Fast food advertising in vulnerable communities.

## Targeted Marketing

How do we stop this epidemic?

GLP-l Agonist!





# GLP-1 Receptor Agonists: Mechanism



References: New England Journal of Medicine. 2021;384:1189-1201; Nature Reviews Endocrinology. 2020;16:431–443; Journal of Clinical Endocrinology & Metabolism. 2022;107(5):1471-1486.

# GLP-l Agonist Concentration: Pharmacologic vs. Physiologic

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## Natural GLP-1

Peaks at 15-30 pmol/L after meals. Rapid degradation within minutes.

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### Pharmaceutical GLP-1

Sustained peak levels of 60-90 pmol/L. Liraglutide reaches 40-60 pmol/L, while semaglutide can achieve 80-100 pmol/L. Remains active for hours to days.

## **Receptor Saturation**

Pharmaceutical dosing achieves 4-6× higher receptor activation than physiologic levels.

References: Journal of Clinical Endocrinology & Metabolism. 2022;107(8):2185-2197; Nature Reviews Endocrinology. 2023;19:324-337

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# GLP-I Impact on Food Preferences

	70%		65%	
Reduced Fast Food		Ultra-Processed Food Reduction		Natural Fo
GLP-1 users report significan decreases in desire for high- calorie fast food options.	t	Patients show mea decrease in consur processed foods w treatment.	asurable mption of ultra- /hile on	Increased pref unprocessed f medication me responses.

GLP-1 medications don't just reduce hunger. They rewire food preferences by altering reward pathways in the brain.

This shift represents a potential mechanism beyond appetite reduction for sustainable weight management.



### 40%

# od Preference

## ference for whole, foods emerges as odifies taste

# Weight Loss Evidence: Critical Appraisal



References: STEP trial: Wilding JPH, et al. N Engl J Med. 2021;384:989-1002; SURMOUNT trial: Jastreboff AM, et al. N Engl J Med. 2022;387:205-216.

# Strengths & Limitations

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Strength: Consistent visceral fat reduction confirmed via imaging biomarkers



Strength: Relatively large sample sizes with diverse populations

Limitation: Long-term maintenance beyond trial periods remains understudied

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# Limitation: Costeffectiveness analyses largely absent from primary publications

# Cardiovascular Outcomes: Leader Trial

#### Study Design

Randomized, double-blind study following 9,340 patients with type 2 diabetes at high CV risk.

Compared liraglutide (1.8mg) versus placebo over median 3.8 years.

#### Primary Outcomes

13% reduction in MACE (cardiovascular death, non-fatal MI, non-fatal stroke).

Number needed to treat: 66 patients for 3 years to prevent one event.

#### Key Findings

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22% reduction in cardiovascular mortality (p=0.007).

Significant reductions in all-cause mortality and kidney disease progression.

LEADER established GLP-1 agonists as more than weight loss tools. They offer significant cardioprotective benefits independent of glycemic control.

Reference: Marso SP, et al. N Engl J Med. 2016;375:311-322.

# Cardiovascular Outcomes: SUSTAIN-6 Trial

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# Trial Design

Randomized double-blind trial of 3,297 patients with type 2 diabetes at high CV risk.

Compared semaglutide (0.5mg or 1.0mg) versus placebo over 104 weeks.

# **Primary Results**

26% reduction in MACE (cardiovascular death, nonfatal MI, non-fatal stroke).

Effect primarily driven by 39% reduction in non-fatal stroke.

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control.

# **Key Implications**

- Cardiovascular benefits
- observed despite shorter
- trial duration than LEADER.
- Demonstrated GLP-1 class
- effect for cardiovascular
- protection beyond glycemic

# Cardiovascular Outcomes: REWIND Trial

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# **Trial** Design

Randomized, double-blind study of 9,901 patients with type 2 diabetes.

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Compared once-weekly dulaglutide (1.5mg) versus placebo over median 5.4 years.

# **Primary Results**

12% reduction in MACE (cardiovascular death, non-fatal MI, non-fatal stroke).

First GLP-1 trial with majority of participants (68.5%) without established CVD.

# **Key Implications**

Demonstrated primary prevention benefit in lower-risk populations.

Consistent benefit regardless of baseline CVD status, age, or BMI.

Reference: Gerstein HC, et al. Lancet. 2019;394:121-130.



# Cardiovascular Benefit Mechanisms



References: Circulation. 2022;145:1389-1403; Journal of the American College of Cardiology. 2021;78(13):1344-1357; Nature Reviews Cardiology. 2022;19:592-604.



# Especially visceral fat loss.



# **GLP-l Side Effects**

# Gastrointestinal

Nausea, vomiting, diarrhea, constipation.

Serious Concerns

Rare pancreatitis, gallbladder disease.

Thyroid Risk

Medullary carcinoma in rodent studies.

# **Injection Issues**

Site reactions, importance of dose titration.



# GLP-I Compliance and Real-World Weight Loss 63%4.7%2-3x

#### Adherence Rate

Many patients discontinue GLP-1 therapy within the first year.

#### Barriers to Adherence

- Gastrointestinal side effects
- Insurance coverage limitations
- Injection fatigue

### Weight Regain

Weight regain occurs within 6 months of discontinuation.

#### **Success** Predictors

- Diet/lifestyle modification integration
- Regular provider follow-up
- Managed side effect expectations

**Real-world effectiveness falls short of clinical trials.** Long-term success requires addressing adherence barriers.

Reference: Wilding JPH, et al. N Engl J Med. 2021;384:989-1002; Rubino D, et al. JAMA. 2022;327(2):138-150.



#### **Cost Factor**

#### Patients with insurance coverage show

higher adherence rates.

Are pills & procedures the only treatment for obesity and chronic disease?



*"There comes a point where we need to stop just pulling"* people out of the river. We need to go upstream and find out why they're falling in."

- Archbishop Desmond Tutu

Treating symptoms isn't enough. We must address the root causes of metabolic disease.



# Root Cause = Stress

# Stress and Heart Disease

#### Chronic Stress

Elevates cortisol and adrenaline. Triggers inflammatory cascade throughout the body.

#### Metabolic Disruption

Promotes visceral fat accumulation. Increases insulin resistance and lipid dysregulation.

#### Cardiovascular Damage

pressure rises.

Chronic stress creates a physiological environment where obesity and cardiovascular disease thrive together.

The same stress-induced mechanisms that promote weight gain directly damage heart tissue and blood vessels.

References: Journal of the American Heart Association. 2021;10:e021751; Psychoneuroendocrinology. 2020;114:104599; European Heart Journal. 2022;43(15):1447-1459.



### Endothelial dysfunction develops.

#### Plaque formation accelerates. Blood

# Stress and Heart Disease







## Yale Study

### Insulin Resistance

High work/home stress increases MI risk by 30%.

**INTERHEART Study** 

Cortisol predicts central adiposity.

Stress hormones promote metabolic dysfunction.

References: Rosengren A, et al. Lancet. 2004;364(9438):953-962 (INTERHEART); Epel ES, et al. J Clin Endocrinol Metab. 2000;85(8):3023-3026 (Yale); Holt RIG, et al. Diabetes Obes Metab. 2021;23(4):915-924.



# The Role of Stress

**Stress Equation** 

Stress = Demands - Resources

Chronic stress raises cortisol, driving visceral fat accumulation.



Fake Resources

# The Motivational Triad



### Conserve Energy

Our brains are wired to save energy whenever possible.

Ultra-processed foods offer high calories with minimal effort.

This ancient survival programming becomes problematic in our modern food environment. Breaking this cycle requires conscious awareness and alternative coping strategies.

- We instinctively avoid physical and emotional discomfort.
- Comfort foods serve as temporary emotional shields during stress.

#### Seek Pleasure

Avoid Pain

- Dopamine rewards drive us toward
- immediate gratification.
- Food manufacturers design products to maximize this pleasure response.

# Stressed $\rightarrow$ Desserts

STRESSED spelled backward is DESSERTS. This wordplay reveals a deeper truth about emotional eating patterns.



Emotional Trigger

Stress activates comfort-seeking neural pathways. The brain craves quick dopamine relief.



# Nutritional Stress

Ultra-processed foods provide temporary comfort but create metabolic inflammation. This perpetuates physical stress.



## Vicious Cycle

Stress-eating creates blood sugar fluctuations. These trigger more stress hormones and cravings.
### Emotional Eating & Obesity

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### Emotional Trigger

Stress, anxiety, or depression activates reward pathways in the brain.

### Food Response

High-calorie foods provide temporary dopamine surge and cortisol reduction.

### Habit Formation

Repeated stress-eating creates neurological pathways reinforcing the behavior.

78% of emotional eaters report difficulty distinguishing emotional from physical hunger.

Breaking the emotional eating cycle requires addressing psychological needs without food.



References: Psychosomatic Medicine. 2019;81(3):265-272; International Journal of Obesity. 2021;45(7):1532-1543

## Nutritional Coping



References: Dallman MF, et al. Proc Natl Acad Sci USA. 2003;100(20):11696-11701; Adam TC, Epel ES. Physiol Behav. 2007;91(4):449-458.

### Ultra-Processed Foods



### Ultra-Processed Foods

Highly manufactured food products engineered with additives, preservatives, and industrial ingredients that significantly alter the natural state of food.



### 55% Obesity Risk

Regular consumption of ultra-processed foods is associated with a 55% increased risk of developing obesity.



### 41% Abdominal Obesity

Ultra-processed food intake correlates with 41% higher rates of dangerous central fat accumulation around vital organs.



### Increased CVD Mortality

Consumption is associated with significantly higher rates of cardiovascular death and disease progression.

### Food Marketing Disparities

### Targeted Advertising

- Fast food marketing in low-income areas
- Meat products heavily promoted
- Unhealthy options more visible

### Minority Children Exposure

- Black children view 86% more food ads than White children
- Hispanic youth see 21% more fast food advertising
- Minority neighborhoods have 4.6x more ads promoting unhealthy foods



References: Rudd Center for Food Policy & Obesity, 2019; Grier SA, et al. J Public Policy Mark. 2020;39(2):156-172; Harris JL, et al. Am J Prev Med. 2015;48(4):384-392 No Choice

## Food Deserts



### Access Barriers

- Limited fresh food options
- Higher prices for healthy foods
- Transportation challenges
- Time constraints for preparation •

## Focus On Building Our Resiliency

The Resilience Equation

*Resiliency Stress* Health =

Not stress itself, but the mismatch between demands and resources.







## How: Get Selfish

- Spiritual
- Exercise
- Love
- Food
- Intimacy
- Sleep
- Humor



### **Evidence-Based Benefits**



### **Reduces** Emotional Eating

Helps individuals recognize and manage emotional triggers for unhealthy eating patterns.



Lowers Cortisol Levels

Decreases the primary stress hormone associated with weight gain and heart issues.





Significant Weight Loss

Obesity Reviews 2017 research confirms meditation practices contribute to meaningful weight reduction.

European Heart Journal 2021 study shows enhanced blood vessel health and cardiovascular function.

### Improved Endothelial Function

### Meditation: Breaking the Craving Cycle

### Neural Rewiring

Regular meditation strengthens prefrontal cortex control over impulsive eating behaviors.

### Reduced Stress Eating

Mindfulness practices lower cortisol by 23%, directly decreasing stressdriven food cravings.

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### Sustained Weight Loss

2019 meta-analysis: Meditation practitioners maintained 3x better weight loss after 6 months.

"Meditation doesn't eliminate cravings—it creates space between the urge and the action."

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### Exercise & Stress/Obesity



#### **Stress Reduction**

Exercise decreases cortisol levels by 15% after just 30 minutes of activity.



#### Cardiovascular Benefits

Regular activity improves endothelial function beyond weight loss effects alone.



Weight Management

through improved mood regulation.

"Exercise is a celebration of what your body can do, not a punishment for what you ate."

Focus on joyful movement rather than calorie-burning. Even 10-minute sessions provide benefits. Consistency matters more than intensity.

### Exercise reduces emotional eating by 40%

### Exercise & Stress/Obesity

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### Journal Review Findings

Exercise reduces emotional eating by 40% through improved mood regulation pathways.

Single 30-minute session decreases food cravings for up to 2 hours post-activity.

### Neurological Mechanism

Physical activity increases BDNF, strengthening prefrontal cortex response to stress.

Endorphin release provides natural reward, replacing food-seeking behavior.

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triggers.

Start with just 5 minutes. Consistency matters more than intensity.

#### **Clinical** Application

#### Prescribe 10-minute "mood walks"

#### before typical emotional eating

#### Focus on joyful movement rather than calorie-burning metrics.

### E = Exercise

### Visceral Fat Reduction

Targets dangerous abdominal fat.

### Improved CRF

Enhances cardiorespiratory fitness.

### **Reduced Inflammation**

Lowers systemic inflammatory markers.

### BJSM 2023 Finding

Only exercise had dose-dependent impact on visceral fat.





## Love



Reduces stress response.



### Gratitude

Improves dietary behavior.



Oxytocin reduces appetite for calorie-dense foods.

# Collaboration is key

### Love & Stress/Obesity

### Self-Compassion

Reduces stress-induced emotional eating and cortisol spikes.

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### **Emotional Regulation**

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Manages cravings through improved neural pathway functioning.

#### Weight Management

shame-based approaches.

Self-compassion during setbacks reduces stress eating. Harsh self-criticism triggers comfort food cravings.1

1. Adams CE, Leary MR. Promoting self-compassionate attitudes toward eating among restrictive and guilty eaters. J Soc Clin Psychol. 2007;26(10):1120-1144.



### Leads to sustainable results versus

### Gratitude Practice & Weight Management

### Study Overview

Journal: Obesity Science & Practice (2021)

Design: Randomized controlled trial

Population: Adults with overweight/obesity

Intervention: Gratitude practice before meals

Practicing gratitude before meals reduced emotional eating by 45% and led to 3.9kg greater weight loss over 8 weeks.

Questions to consider: Long-term sustainability? Mechanism of action? Combination with other interventions?

#### Methodology

Participants randomized to gratitude practice or control group; followed for 8 weeks with measurements of emotional eating behaviors and weight.

#### Strengths & Limitations

Strengths: Quantifiable outcomes, significant effect size

Limitations: Short follow-up period, self-reported measures

#### Clinical Implications

Simple gratitude practices may offer a low-cost, accessible intervention to support weight management by reducing emotional eating behaviors.

## Food

### Plant-Based Diets



#### Lower BMI

Plant-based diets are consistently associated with healthier body mass index and improved weight management.1



#### Reduced Blood Pressure

Significant reductions in blood pressure observed when following plant-based eating patterns.2



Nourish your potential

#### 5.7% Weight Loss

Nutrients 2019 study: Participants achieved 5.7% body weight reduction in just 8 weeks on plant-based diet.3

### Fiber: Natural GLP-l Enhancer

Stimulates L-cells

Increases natural GLP-1 secretion.

**Promotes Satiety** Helps feel full longer.

Stabilizes Blood Sugar

Prevents spikes and crashes.

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Sustainable Weight Loss

J Nutr 2019: Independent of calorie reduction.



### Mediterranean & Time-Restricted Eating

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### Metabolic Reset

Fasting periods allow insulin levels to drop, promoting fat burning.1

### Visceral Fat Reduction

Cell Metabolism 2019: 3% reduction in visceral fat after 12 weeks.2

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### Improved Satiety

Naturally enhances G medication.3

### Mediterranean Pattern

Combines perfectly with time-restricted eating for enhanced metabolic flexibility.4

1 Mattson MP, et al. N Engl J Med. 2019;381:2541-2551. 2 Wilkinson MJ, et al. Cell Metabolism. 2019;30(1):92-104. 3 Hutchison AT, et al. Obesity. 2019;27(8):1244-1254. 4 Muscogiuri G, et al. Eur J Clin Invest. 2018;48(9):e12980. 5 Chaix A, et al. Cell Metabolism. 2019;29(6):1378-1388.

### Implementation

Start with 12:12 window. Gradually extend to 16:8 for optimal benefits.5

#### $\heartsuit$

#### Naturally enhances GLP-1 production without

## Mindful & Intuitive Eating

### Present-Moment Awareness

Fully engaging with eating experience reduces stressinduced overeating.

### Body Signals

Responding to true hunger and fullness cues prevents emotional consumption.

### Non-Judgmental Approach

Eliminating food guilt eating.

JAMA IM 2016: Mindfulness intervention participants lost 4.3% body weight.

Eat with intention and attention, not on autopilot.

### improves relationship with

### Mindful & Intuitive Eating



#### Awareness

Recognizes hunger and fullness cues without judgment, allowing your body to guide eating decisions naturally.



### Food Relationship

Transforms emotional eating patterns into conscious nourishment choices that honor both body and mind.



#### Evidence

conventional diets with better psychological outcomes (Obesity Reviews, 2019).

Sustainable change comes through awareness, not restriction.

## Meta-analysis: Equivalent weight loss to



## Intimacy - Stress & Obesity



### **Isolation Risk**

Social isolation increases cardiovascular disease risk by up to 30%, affecting heart health through multiple pathways.



### **Group Benefits**

JAMA Network Open 2022: Support groups improve adherence to health recommendations and lead to better clinical outcomes.



### Weight Loss

Group-based interventions significantly improve weight loss success rates compared to individual efforts alone.

## Social Support & Weight Loss

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### Accountability Factor

Individuals with strong support networks lose 32% more weight than those going solo.1

### Consistency Champion

Group participants maintain 42% higher adherence to lifestyle changes over 18 months.2

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journeys.3

Connection is the foundation that makes change possible and sustainable.

### **Stress Buffer**

### Social connections reduce cortisol levels by up to 26% during weight loss



S = Sleep

Sleep Loss

Disrupts hormonal balance.

Hormone Changes

Increased ghrelin, decreased leptin.

Hunger Signals

More cravings, less satiety.

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Central Obesity

Promotes dangerous fat accumulation.



### Sleep Deprivation & Obesity

### Sleep Debt

Just one night of poor sleep increases hunger hormones by up to 24%.

### Cravings Surge

Sleep-deprived brains show heightened response to high-calorie foods.

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#### Weight Gain

Chronic sleep loss linked to 55% higher obesity risk.

Quality sleep is as essential to weight management as diet and exercise.

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## H = Humor

### Laughter Benefits

- Lowers cortisol levels
- Boosts mood and resilience
- PLoS One 2020: Mitigated stress symptoms
- BMC Geriatrics 2022: Improved BMI and wellbeing





## True Healing

Obesity isn't just a weight issue—it's a stress issue.

Help patients replace "fake resources" with real ones: community, rest, movement, purpose, and fiber rich food.








Obesity isn't just a weight issue—it's fundamentally a stress issue affecting the entire body.



## Call to Action

Inquire About Home Environment

2 Don't Be Afraid To Prescribe Lifestyle

3 **Integrate Medical Advances**